WATER & SEWAGE WORKS

WATER SOFTENING AND FILTRATION PLANT OF FORT WAYNE, IND.

NOW...NO WATER SUPPLY JOB TOO SMALL... OR TOO LARGE!

With the establishment of its new permanent pressure pipe plant in Wharton, N. J., Lock Joint Pipe Company is now able to supply pressure pipe in any desired quantity and in a larger range of diameters than heretofore.

The Wharton Plant, specializing in Lock Joint Prestressed Concrete Cylinder Pipe, is equipped to produce pressure pipe in all standard diameters from 16" up, and for all pressures common to American water works practice.

★ ★ ★

Prompt delivery can be effected by truck for short hauls direct to the installation site, or by rail to more distant localities.

SCOPE OF SERVICES — Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

LOCK JOINT PERMANENT PRESSURE PIPE PLANT AT WHARTON, N. J.

LOCK JOINT PIPE COMPANY

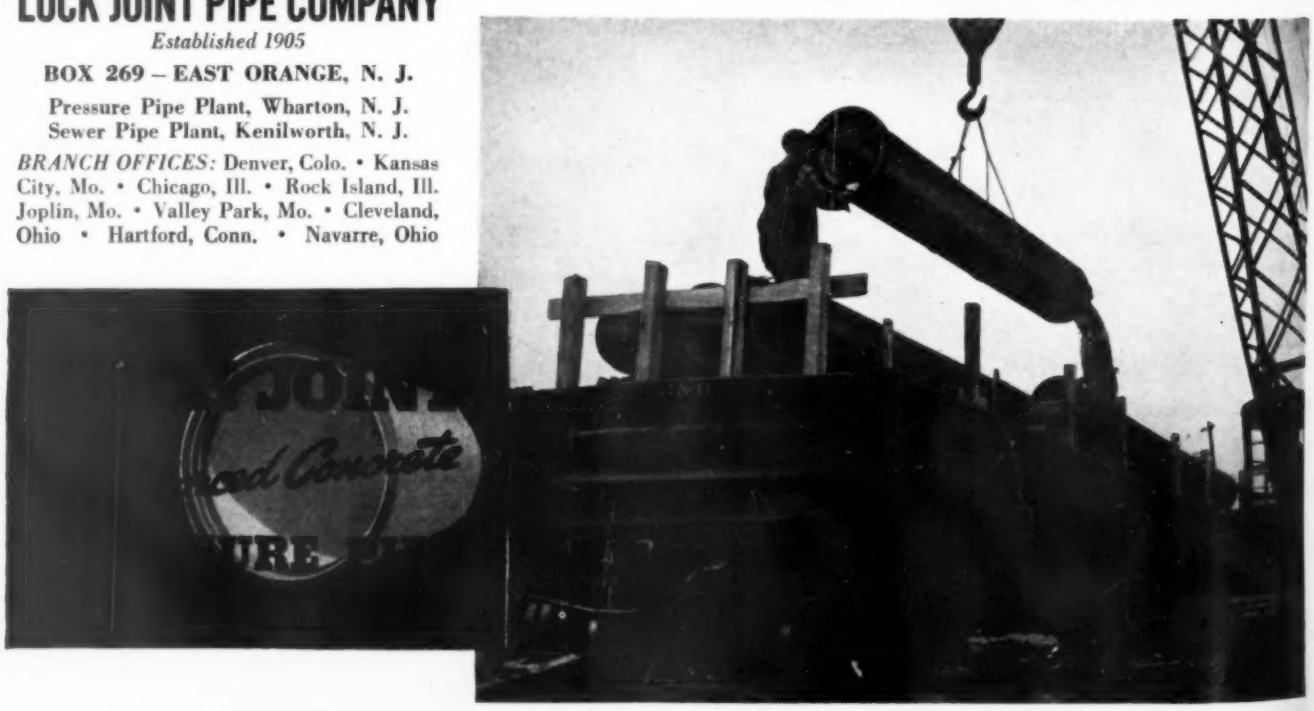
Established 1905

BOX 269 — EAST ORANGE, N. J.

Pressure Pipe Plant, Wharton, N. J.
Sewer Pipe Plant, Kenilworth, N. J.

BRANCH OFFICES: Denver, Colo. • Kansas City, Mo. • Chicago, Ill. • Rock Island, Ill. Joplin, Mo. • Valley Park, Mo. • Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

LOADING PIPE IN RAILROAD CARS AT WHARTON PLANT



WATER AND SEWAGE WORKS, "Reg. U. S. Pat. Off. November, 1947. Volume 94. Number 11. Published monthly by Gillette Publishing Co. 22 W. Maple St., Chicago 10, Ill. Per copy, 25c. Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign,

Because-

The Chicago Wide-Band Air Diffusion System using Swing Diffusers is established as the criterion of superior aeration performance in activated sludge sewage treatment plants because . . .

- Swing Diffusers can be raised to tank walk for rearrangement, addition or removal of tubes, or tube cleaning. Tanks need not be drained.
- Control orifice provides uniform air distribution to diffuser tubes.
- Tubes are located two feet above tank floor . . . blower discharge pressure is proportionately reduced.
- Wide band of fine bubbles prevents coalescing, increases contact volume and contact period between air and mixed liquor.
- The Wide-Band system, having greater air lift effect, develops better tank circulation characteristics.
- Tapered aeration is readily effected . . . adjustment of tube arrangement and air supply, can be made to meet oxygen demand.

Operating results from over a hundred successful installations verify these statements. Swing diffusers may be installed to replace obsolete systems. The logical choice for new plants or for expanding present facilities.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2349 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

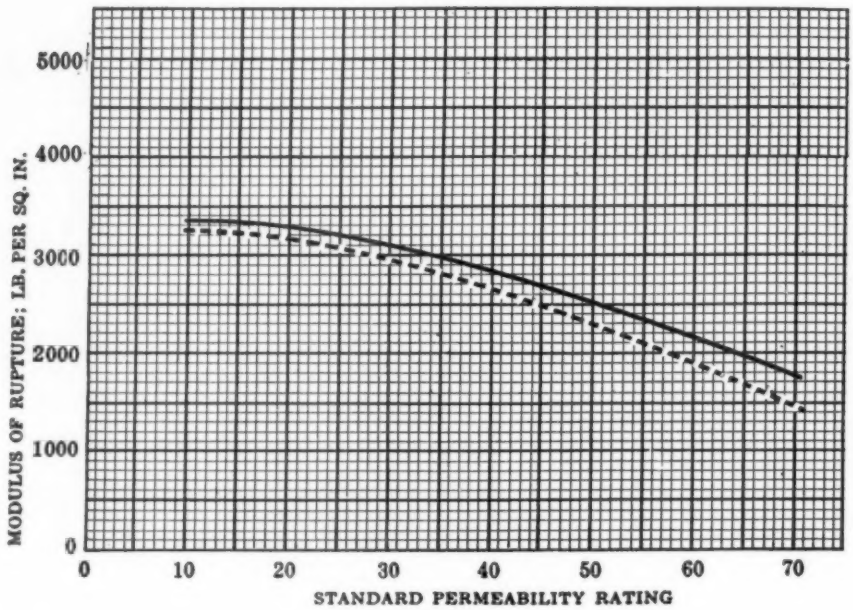
Flush-Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

Making Sewage Aeration More Effective with ALOXITE Diffusers

RELATION OF STRENGTH TO PERMEABILITY

——— Dry
— — — Saturated



Dependable Trouble Free Service Assured

ALOXITE aluminum oxide porous plates and tubes are rugged and durable. This is exemplified in the chart giving their high modulus of rupture for various permeability rating. It is confirmed by experience in over 225 plants. ALOXITE diffusers last longer, require less maintenance and far less frequent replacement. Some operators even report that cleaning is still unnecessary after more than ten years service.

ALOXITE diffusers stand up under repeated handling. They resist chemicals, acids and other corrosive materials. They can be quickly and thoroughly cleaned by chemicals, chlorination, acid treatment, burning, etc.

The more effective treatment made possible by ALOXITE plates and tubes is also more economical. Maintenance and replacement costs are negligible. Further savings are realized in the lower operating and maintenance requirements of blowers and other equipment.

In brief, these are a few facts that have led to the installation of these modern air diffusers in many plants. We will be glad to furnish further details. Our technical staff will be glad to discuss problems peculiar to your operating set-up. Merely write Department O-117, The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.

DIFFUSER MEDIA

UNIFORM STRUCTURE
CORROSION RESISTANT
RUGGED AND DURABLE
ECONOMICAL
EASY TO CLEAN
LOW PRESSURE LOSS

BY **CARBORUNDUM**
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WATER & SEWAGE WORKS

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L. H. ENSLOW, Editor
155 East 44th Street, New York 17, N. Y.

COMING!

Responsibilities of Water and Sewage Works Operators

Needs no further amplification than the title of this straight from the shoulder paper by the author speaking as the president of the Sewage Works Federation—

F. S. FRIEL, Consulting Engineer, Philadelphia, Pa.

Iron and Manganese Removal

Is a comprehensive article setting forth the various procedures and equipment for the removal of iron, manganese (or both) from water and the selection of the proper combination for conditions at hand. The author—

S. B. APPLEBAUM, President, Liquid Conditioning Corp., New York.

Pipe Line Capacity— Its Preservation or Restoration

Constitutes a brief review of the causes of loss of delivery capacity of pipe lines with increasing age, and the high cost of such depreciation. Then follows a description of known and tested remedial measures for the correction or elimination of such losses, including measures for the restoration of capacity of existing pipe lines, reduction in pumping costs, etc. Contributed but a short time before his recent passing, the author is the late—

WM. S. LEA, Consulting Engineer, Montreal, Canada.

Employer-Employee Relationship in Water Utilities

Constitutes a discussion of this important topic in which is revealed some pertinent pointers concerning the opportunities of management of water utilities to make the employee's position more attractive and more nearly comparable with similar positions in other industries. What one privately owned water utility is doing to raise the status of the water works employee sets a pattern as a foundation for improved public relations which now as always must "start at home." The author is—

J. W. HEINEY, Manager, N. J. Div., Water Utilities Service Co., Palmyra, N. J.

Investigating the Chemical Quality of Underground Waters

Is a report of problems of water quality from deep wells and the effects of such quality on the distribution system and customer's piping. The use of conductance equipment for determining the quality of water from various wells and various strata of the same well is described by—

J. R. ROSSUM, San. Engr., Calif. Water Service Co., San Jose, Calif.

Hydraulics for the Practical Water Works Man

Is a continuing series of articles by Prof. R. W. Angus of Toronto, for many years a teacher of hydraulics and consulting engineer.

Utilization of Chlorine During Septicization of Sewage

Is a report on studies made of sewage chlorination and the economics of the process as affected by septicization, all of which has a pertinent bearing on methods of chlorination to employ in order to obtain maximum effectiveness and the greatest chlorine economy. The author is—

H. HEUKELEKIAN, Rutgers Univ., New Brunswick, N. J.

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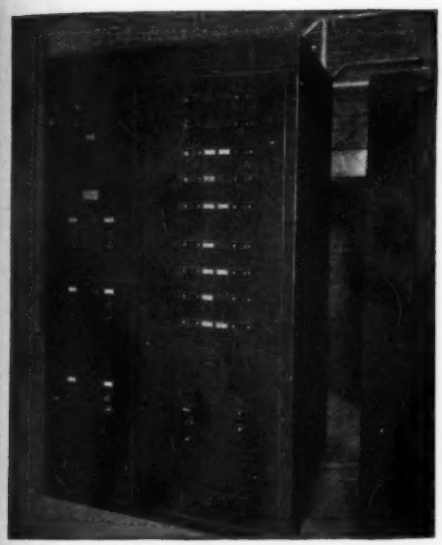
"WESTINGHOUSE-EQUIPPED THROUGHOUT" MEANS SIMPLIFIED ORDERING, QUICKER INSTALLATION, MORE EFFICIENT OPERATION

Putting power to work *productively* can be a major problem—or a simple one. When items must be selected, ordered and received from many sources, it means many chances for costly errors and delays . . . divided responsibility—or none at all—for performance of installed equipment.

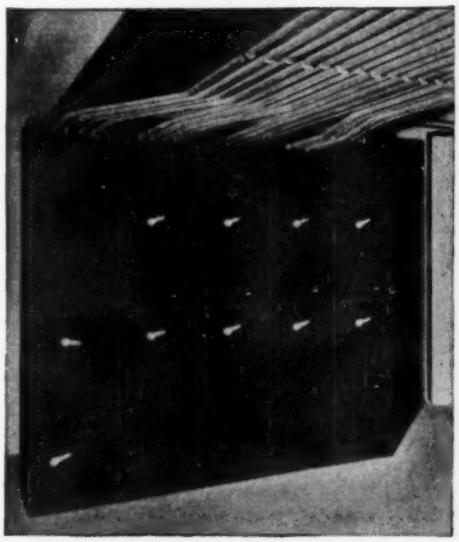
Westinghouse offers the way to simplify the job. From equipment for generation of electrical or steam power, to the most specialized types of drives and control for its utilization, Westinghouse provides a single source of supply . . . one broad pair of shoulders competent to take responsibility for performance of all parts of the job.

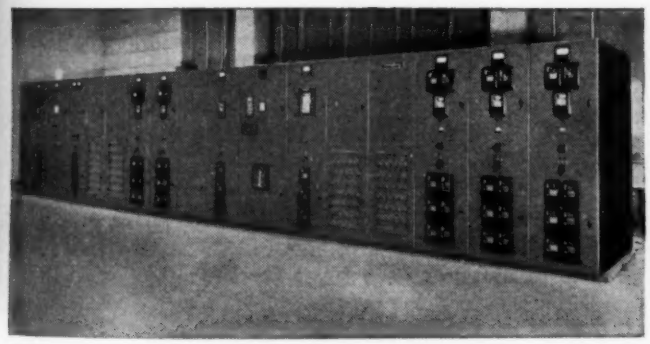
Here are a few of the places where Westinghouse unit responsibility prevents headaches . . . saves money . . . assures *more productive* power:



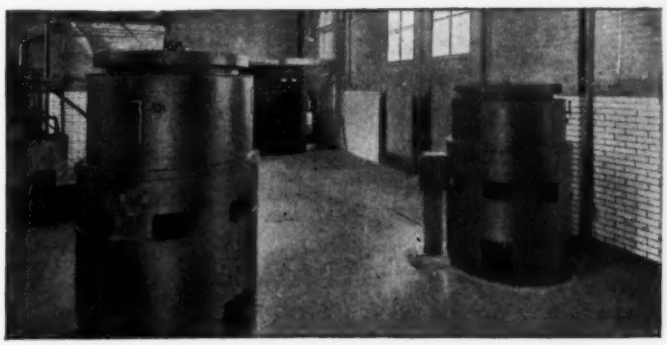
PANELBOARDS—Westinghouse control panelboard installed in a 9,000 gpm plant, including main incoming breaker, motor feeder breakers, lighting and auxiliary circuits; all in one attractive, easily installed unit.

CONTROL CENTERS—Typical Westinghouse Control Center which houses control for auxiliary motors at one centralized location—improves operating safety, simplifies operation and maintenance. Additional units can be added as needed.





SWITCHGEAR—Westinghouse Indoor Metal-clad Switchgear (2,300 volts) for feeder circuits to main pump motors. Factory assembled and tested to assure proper protection of vital equipment. Installed as a unit.



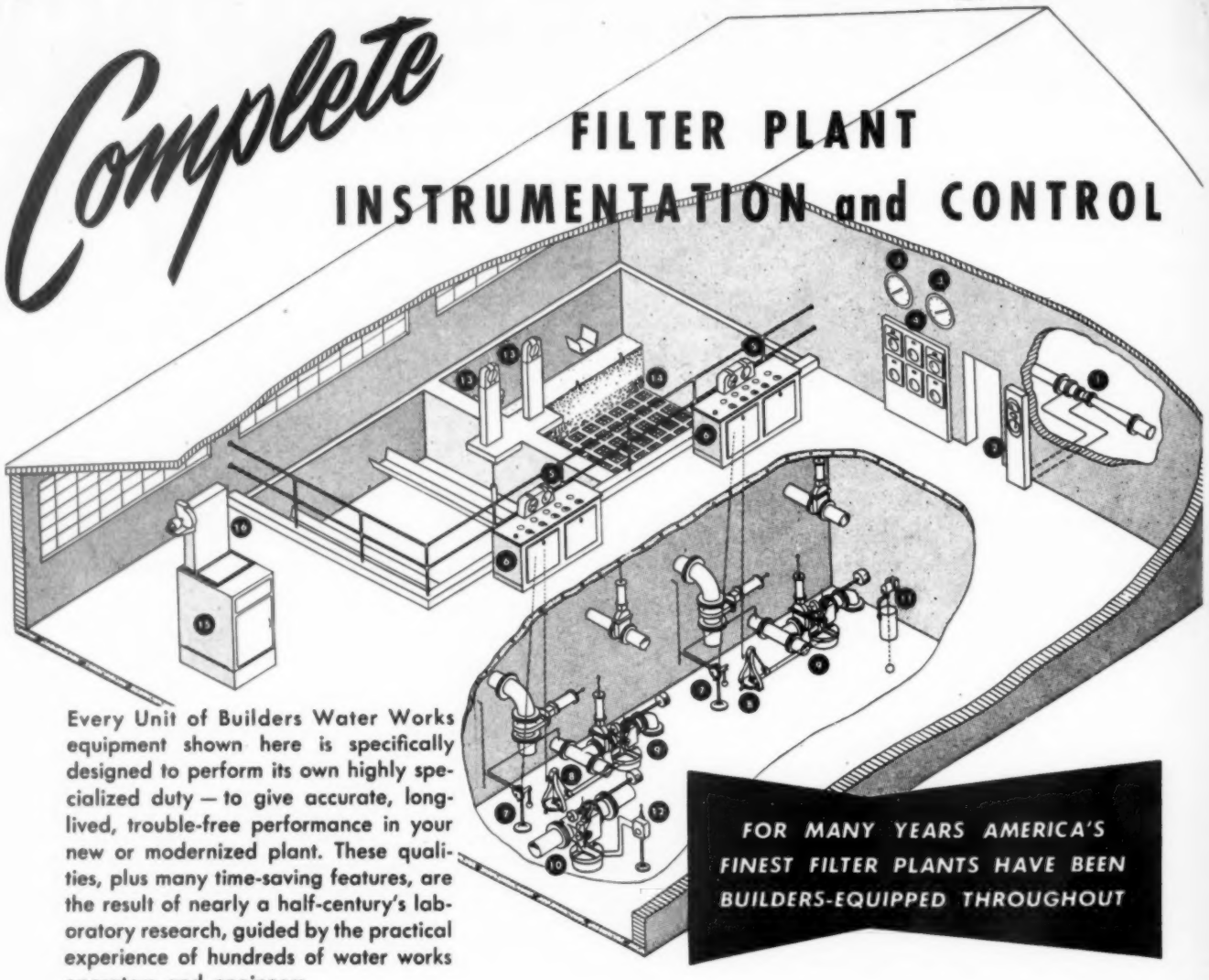
MOTORS—One 350/160 and one 250/100 hp two-speed Westinghouse CS Motors driving main sewage disposal pumps. (Metal-clad control panel in background.) These motors use low speed and low hp for normal sewage flow. High speed and high hp increase pumping capacity 300 percent for handling emergency conditions.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

MORE PRODUCTIVE POWER FOR INDUSTRY

Complete FILTER PLANT INSTRUMENTATION and CONTROL



Every Unit of Builders Water Works equipment shown here is specifically designed to perform its own highly specialized duty — to give accurate, long-lived, trouble-free performance in your new or modernized plant. These qualities, plus many time-saving features, are the result of nearly a half-century's laboratory research, guided by the practical experience of hundreds of water works operators and engineers.

FOR MANY YEARS AMERICA'S FINEST FILTER PLANTS HAVE BEEN BUILDERS-EQUIPPED THROUGHOUT

1. Herschel Standard Venturi Tube for Raw or Filtered Water.
2. Type M Register-Indicator-Recorder.
3. Large Dial Illuminated Gauges for Wash Water and Raw or Filtered Water.
4. Central Control panel with main line meters, water level Telemeters for remote tanks and reservoirs, etc.
5. Loss of Head and Rate of Flow Gauges.
6. Filter Operating Table with Hydraulic controls and valve position indicators.
7. Diaphragm Pendulum Unit for Loss of Head Gauge.
8. Diaphragm Pendulum Unit for Rate of Flow Gauge.
9. Venturi Filter Effluent Rate Controller.
10. Venturi Wash Rate Controller.
11. Chronoflo Transmitter for Clearwell Gauge.
12. Chronoflo Transmitter for Wash Water Gauge.
13. Sand Expansion Gauge.
14. Wheeler Filter Bottom.
15. Omega Gravimetric Dry Chemical Feeder with automatic proportional control from Raw Water Meter.
16. Omega Dust Remover.

For Bulletins, address BUILDERS-PROVIDENCE, INC., (Division of Builders Iron Foundry)
10 Codding Street, Providence 1, R. I.

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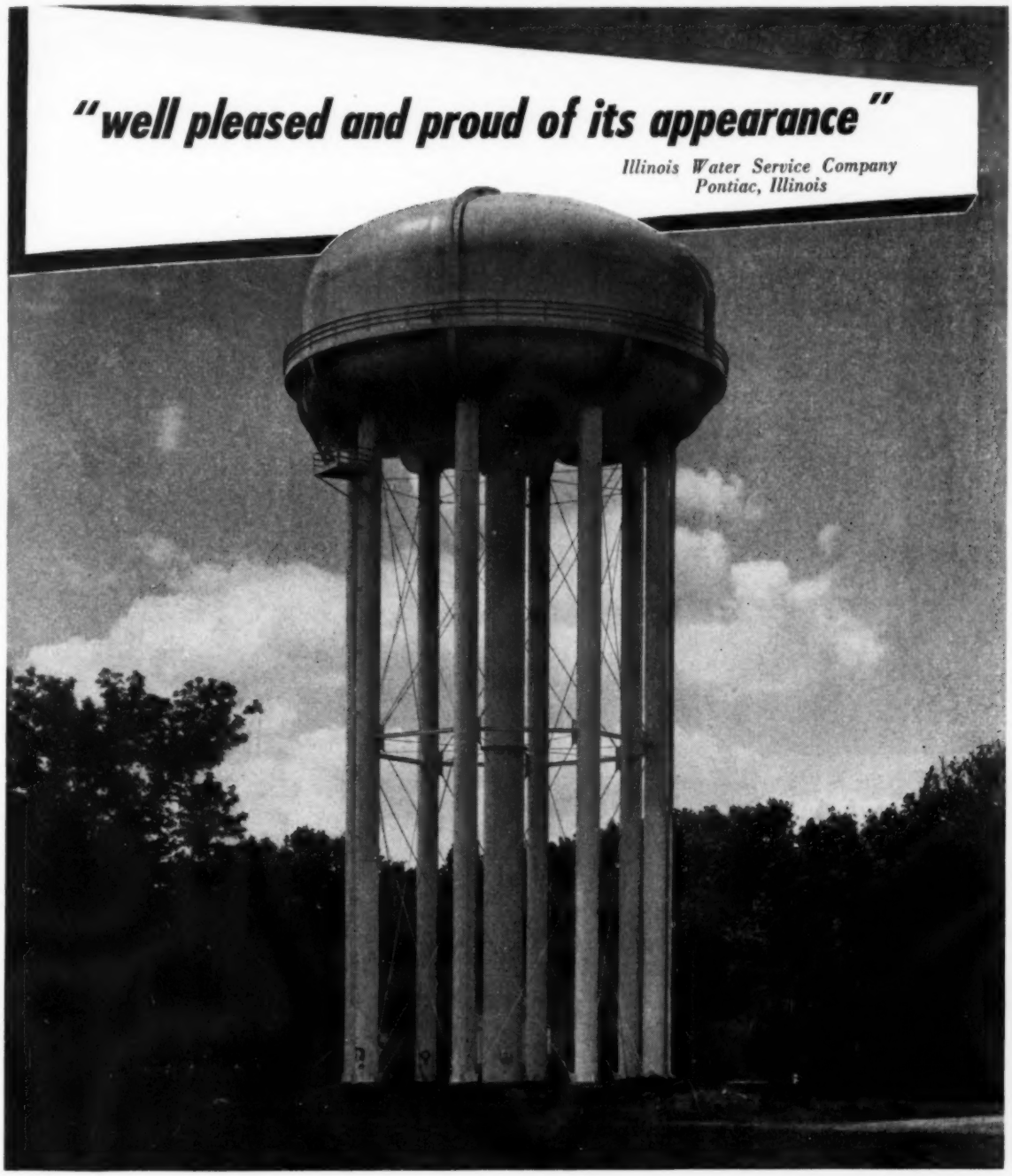
BUILDERS PROVIDENCE *Instruments*



The 500,000-gal. Horton elevated water tank shown above was recently erected at Pontiac, Illinois to provide gravity pressure in the distribution system. The *statement* at the top of this page is typical of how municipalities feel about Horton elevated water tanks.

Since the installation of this tank, water pressure in the distribution system has remained practically constant at 52 lbs. per sq. in. More uniform water pressure is only one of the many benefits provided by elevated storage. Others include more dependable supply of water for fire protection, lower insurance rating, maintenance of pressure during temporary power failure and lower pumping costs.

Get the advantages of *Horton* elevated tanks. Write our nearest office for information or quotations.

DATA REGARDING THE PONTIAC DISTRIBUTION SYSTEM

Source of Water—River.
Area Served—3 sq. mi.
Storage Capacity—500,000 gals. in elevated storage—165,000 gals. in standpipes.
Length of Distribution Mains—23.9 mi.
Minimum Daily Consumption—800,000 gals.
Maximum Daily Consumption—1,400,000 gals.

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New York 6.....3390-165 Broadway Bldg.
Cleveland 15.....2262 Guildhall Bldg.
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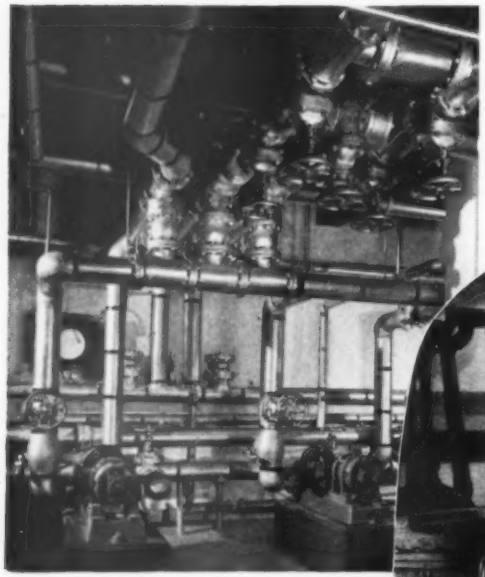
Detroit 26.....1551 Lafayette Bldg.
In Canada: Horton Steel Works, Limited, Fort Erie, Ont.

valves may look alike ...But

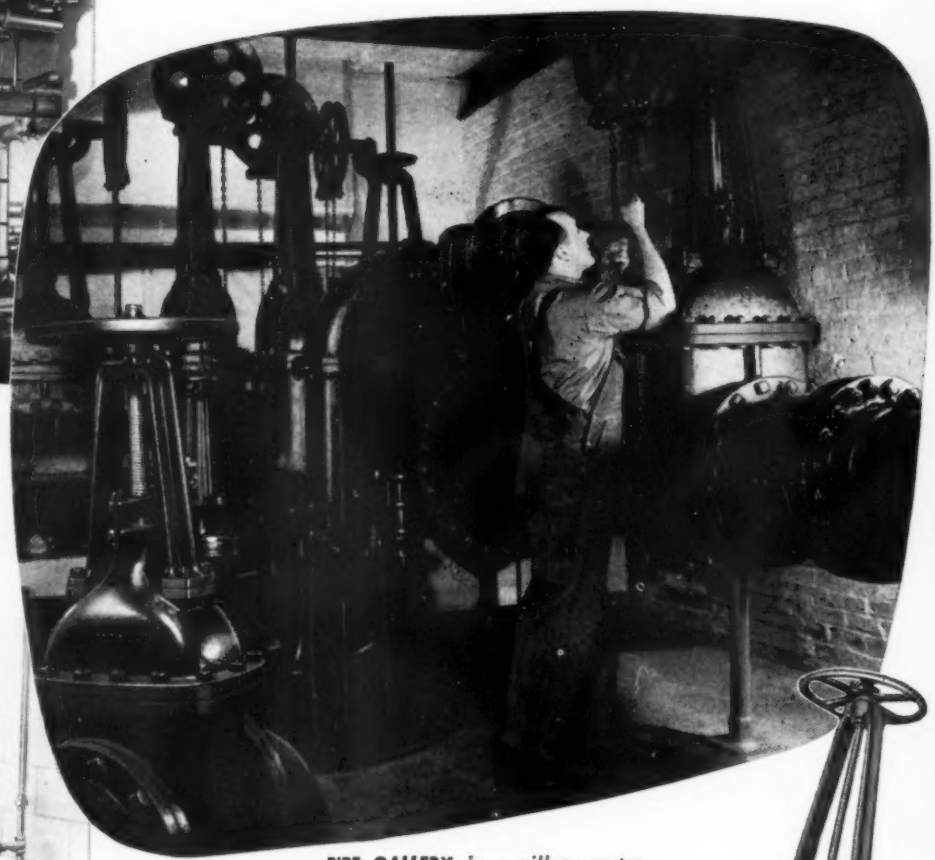
... It's performance that counts! And Crane valves keep proving the truth of this axiom by year in and year out dependability in utilities service.

Since the beginning of modern flow control methods in waterworks and sewage plants, Crane valves and fittings have stood out in these important installations. Not because of appearance, but because of outstanding performance under all conditions. Today, Crane Quality is still your best value in piping equipment.

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois. *Nationwide Service Through Branches and Wholesalers.*

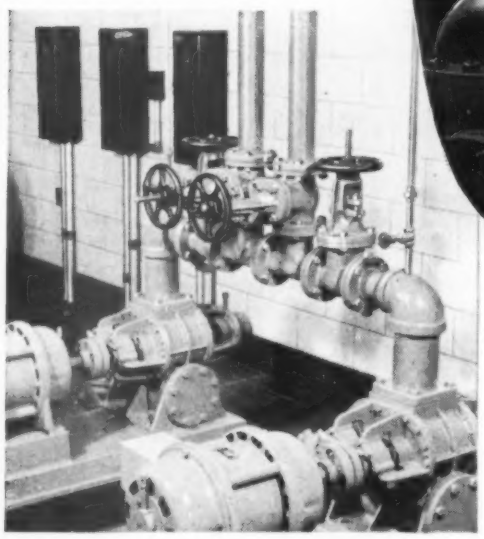


PUMP LINE PIPING *in sewage treatment plant with Crane standard iron body double disc gate valves. Plant serves about 25,000 population.*



PIPE GALLERY *in a village water works showing Crane iron double disc gate valves and fittings on main discharge lines to distribution system.*

PRIMING PUMPS *in a large metropolitan pumping station, equipped with Crane flanged and screwed piping materials.*



HIGH EFFICIENCY CONTROL FOR LOW PRESSURES ... *in water works, filtration plants, sewage disposal systems, etc. Where service conditions do not require "standard" weight valves, Crane No. 793½ Low Pressure Iron Body Double Disc Gate Valves, with brass trim, will give excellent service at minimum cost. Crane quality design throughout; rated at 25 pounds steam, up to 50 pounds cold water. Sizes 10 in. and larger. See your Crane Catalog, pp. 122-123.*

EVERYTHING FROM ...

CRANE

FOR EVERY PIPING SYSTEM

CHEMICALS

GENERAL CHEMICAL COMPANY

GEARED TO THE NEEDS OF INDUSTRY

PAPER

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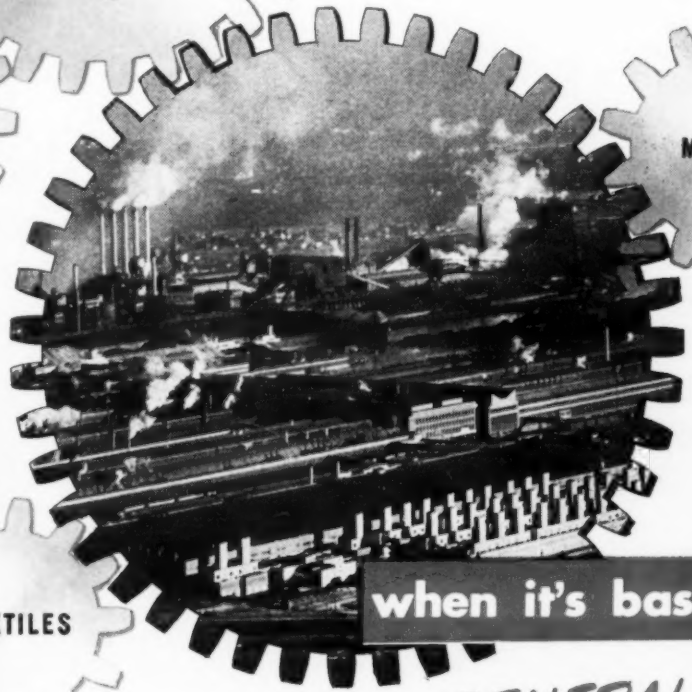
WATER & SEWAGE

LEATHER



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This way, General Chemical products are always geared to the needs of Industry . . . their grades and strengths meeting the most exacting requirements of the day. From such closely meshed efforts are coming General Chemical's new organic and inorganic chemicals for the process industries of tomorrow. The past stands proof that these, too, will be equally essential "Basic Chemicals for American Industry."

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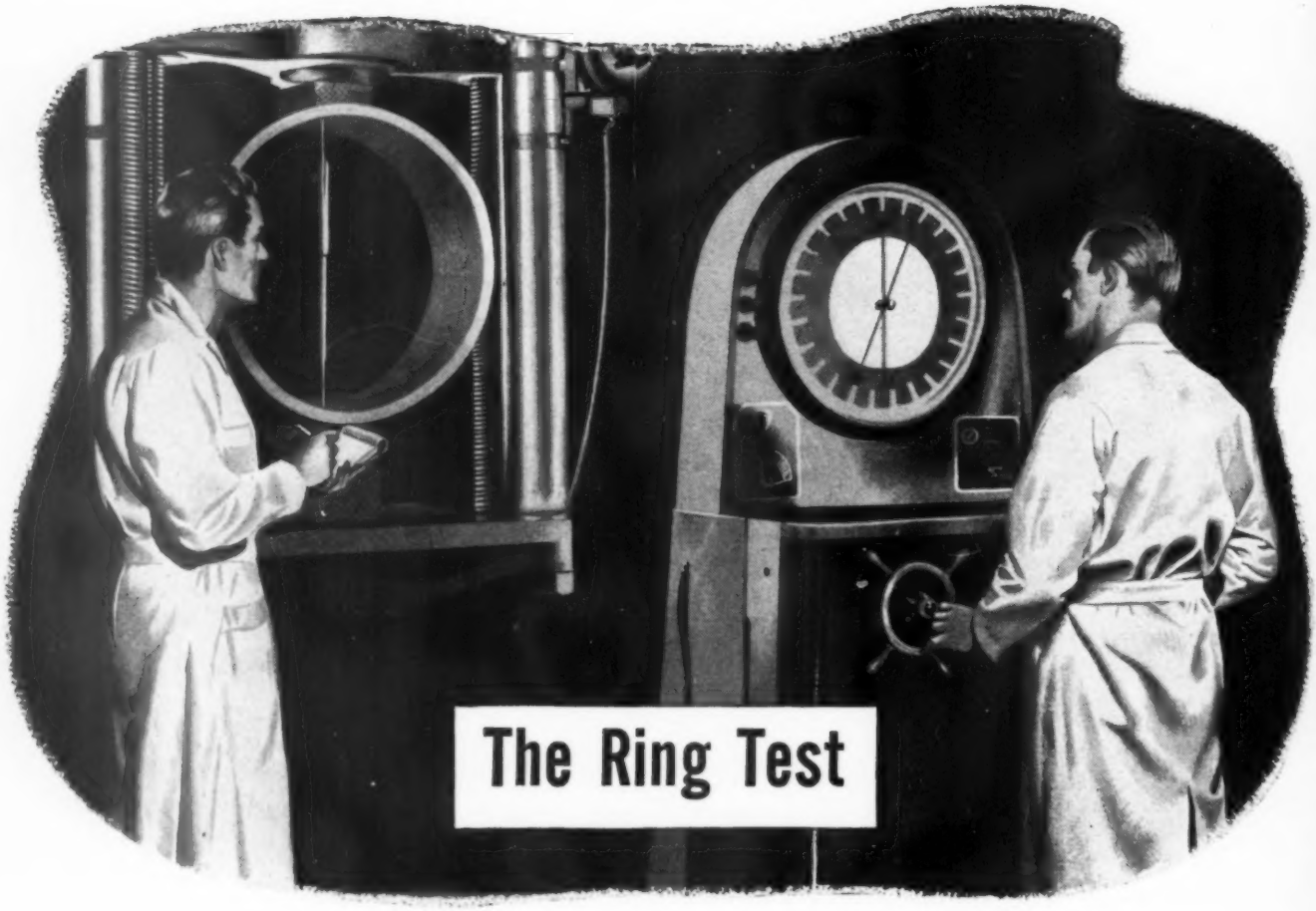
PUTTING SCIENCE TO WORK



THE ring test, shown above, is a scientific method for determining the modulus of rupture of pipe. It is not a required acceptance test but one of the additional tests made by cast iron pipe manufacturers to ensure that the quality of the pipe meets or exceeds the requirements of standard specifications.

A ring, cut from random pipe, is subjected to progressively increased crushing load until failure occurs. Standard 6-inch cast iron pipe, for example, withstands a crushing weight of more than 14,000 lbs. *per foot*. Such pipe meets severe service requirements with an ample margin of safety.

Scientific progress in the laboratories of our members have resulted in higher attainable standards of quality in the production processes. By metallurgical controls and tests of materials, cast iron pipe is produced today with precise knowledge of the physical characteristics of the iron before it is poured into the mold. Constant

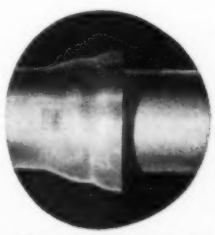
CAST IRON PIPE

TO PROTECT PIPE QUALITY

control of cupola operation is maintained by metal analysis. Rigid tests of the finished product, both acceptance tests and routine tests, complete the quality-control cycle. But with all the remarkable improvements in cast iron pipe production, we do not forget the achievements of the early pipe founders as evidenced by the "Survival and Retirement" report recently published by the A. W. W. A. Of all the cast iron pipe laid in the 25 cities studied, some as early as 1817, more than 96 per cent of all pipe, 6 inches and over, is still in service.

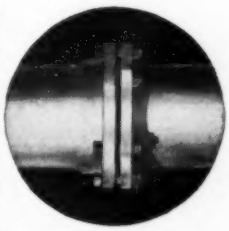
"Cast iron pipe not only offers a century or more of efficient life as a structure—it offers a century or more of efficient life as a carrier. In the limited areas with tuberculating waters, cement-lined cast iron pipe is tuberculation-proof and insures high carrying capacity for the life of the pipe. In the greatly predominating areas without tuberculating waters, the carrying capacity of unlined cast iron pipe remains practically unimpaired for the life of the pipe."

Joints for Cast Iron Pipe



Bell-and-Spigot Joint: the standard joint for water and sewerage service.

A variety of joints are available, of which the two most widely used are illustrated. Special purpose joints such as the Ball-and-Socket, or Flexible Joint for underwater use, and the Flanged Joint for above-ground use, are also available.



Mechanical Joint: bottle-tight and flexible, now with interchangeable parts.

"SILENT SERVICE is not enough"—A.W.W.A.

The American Water Works Association is recommending to its members, for local action, a sound, well-planned program of Public Relations publicity and advertising. It is based on the premise that good water service, like good health, is too often taken for granted, in which case favorable public opinion is dormant.

To co-operate with this program and help to arouse national recognition of the efficient service rendered by America's water supply systems, the Cast Iron Pipe Research Association is presenting little known facts about public water supply to the *six million* readers of "Time" and "Nation's Business" throughout 1947.

For example, the following human-interest cartoon and excerpts from a current advertisement.

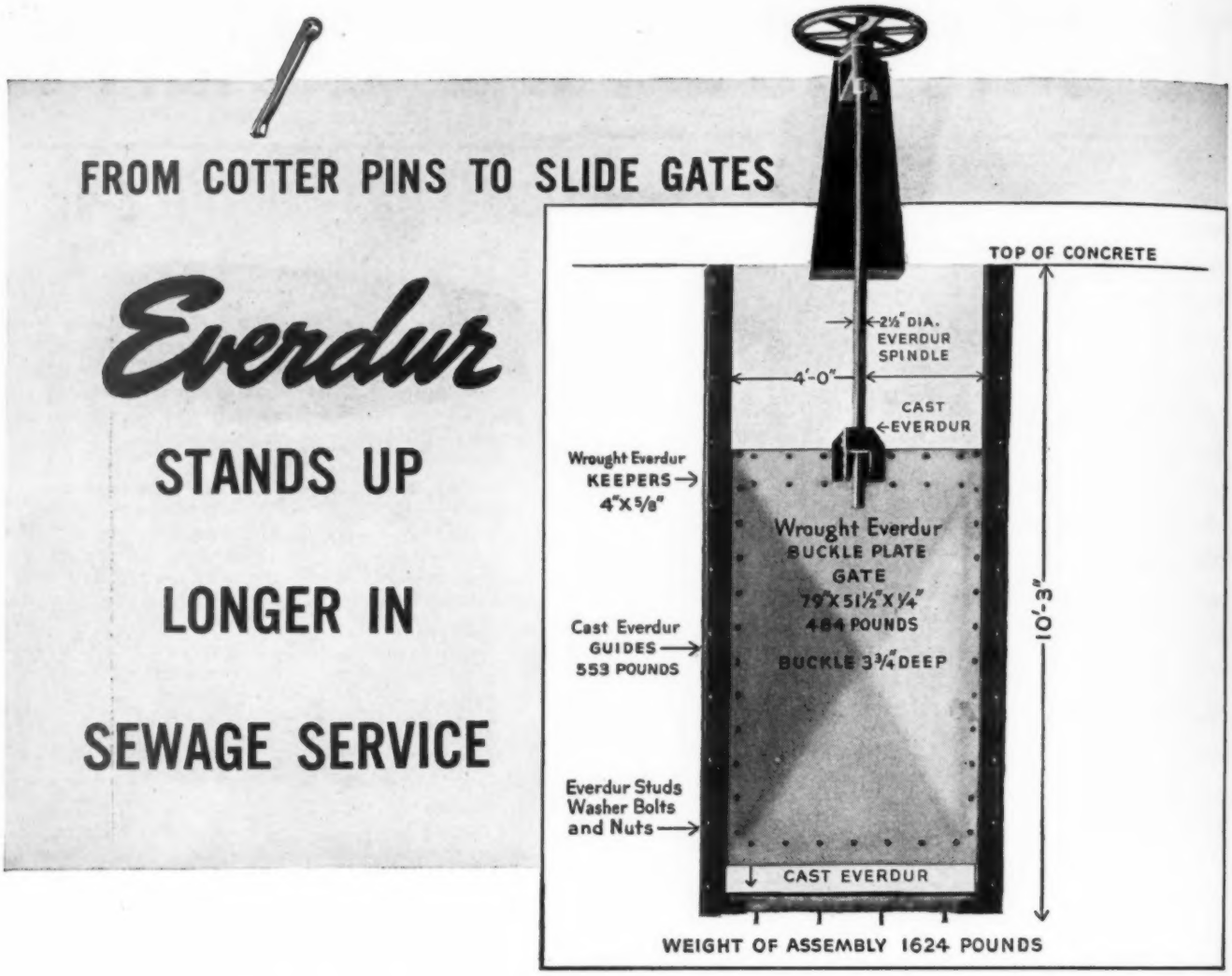
"biggest penny in the world"

It buys you more than 500 glasses of safe, palatable water supplied by your public water supply system. Yes, the penny you spend for that indispensable service—*water* service—has the highest purchasing power in the world. Less than ten of them buys 300 gallons (average daily family consumption) delivered to your faucets. Yet few of us stop to consider that this convenient, reliable, low-cost service is due to the efficiency of America's public water supply systems.

Another big reason for the low cost of water is cast iron pipe because of its low maintenance cost and unequalled long life.

A good water supply rarely receives public recognition because, like good health, it is taken for granted. But it is the community's greatest asset, guarding health, life and property. Cast Iron Pipe Research Association, T. F. Wolfe, Engineer, 122 So. Michigan Avenue, Chicago 3, Illinois.

SERVES FOR CENTURIES



FROM COTTER PINS TO SLIDE GATES

Everdur

STANDS UP LONGER IN SEWAGE SERVICE

One of the five 13-year-old shut-off gates of Everdur Metal in the screen room of the Rahway Valley Joint Meeting Sewage Treatment Plant.

FOR 20 years Everdur* Copper-Silicon Alloys have performed well under the corrosive conditions imposed on sewage treatment equipment. These alloys have unusual resistance to corrosion. In addition, they provide high strength and, according to type, may be cast, hot or cold rolled, drawn, spun, forged or welded.

A good example of Everdur advantages is seen in the five shut-off gates in the screen room at Rahway, N. J., installed more than 13 years ago. These gates, which operate smoothly and easily by hand, weigh 1624 lbs., while cast, electrically-driven gates for the same service would have weighed well over four tons each!

In view of the fact that sewage service must not fail, a cotter pin may be as essential as the most massive equipment. Thus, Everdur Metal has been more and more widely specified for such uses as:

Coarse and Fine Screens
Swing Gates
Built-up Sluice Gates
Bar Rack Aprons
Effluent and Scum Weirs
Scum Baffle Brackets
Troughs
Screen Hoppers
Orifices
Backets
Anchors
Ladders
Float Gage Chains
Valve Springs
Manhole Steps
Guides
Walkways
Bars and Plates
Bolts and Nuts

For detailed information, write for Publications E-11 and E-5.

*Reg. U. S. Pat. Off.

47189

ANACONDA
from mine to consumer

Everdur

COPPER-SILICON ALLOYS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD.
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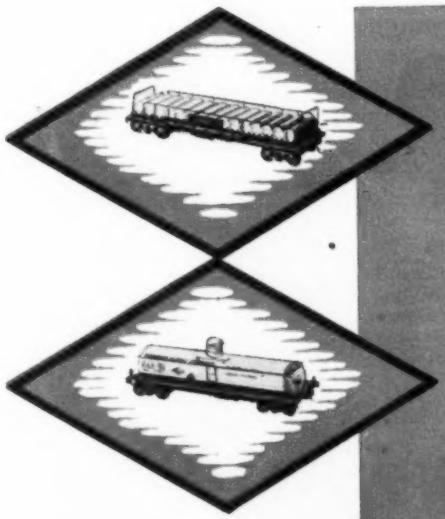
DIAMOND *Liquid* CHLORINE

Furnished in cylinders



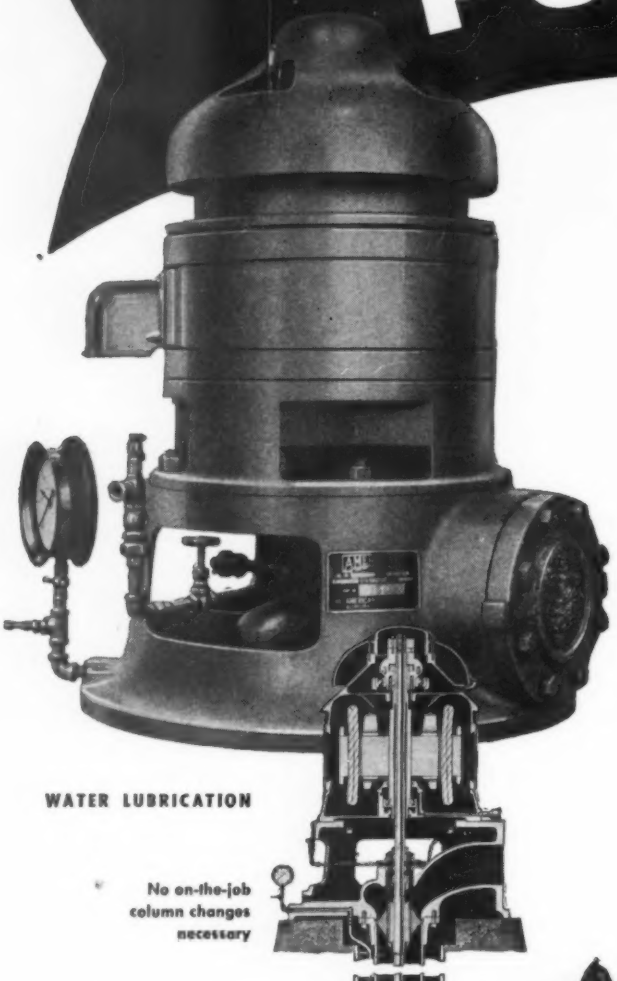
multi-unit cars, or
tank cars, to meet
your requirements

DIAMOND ALKALI COMPANY

PITTSBURGH 22, PA. *and Everywhere*

CHLORINE

Still in there... PUMPING!



WATER LUBRICATION

No on-the-job column changes necessary

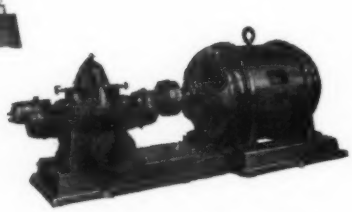
AMERICAN PUMPS installed many years ago are still delivering specified quantities of water at low cost on farms, in municipalities and industrial plants throughout the world. Today, with modern improvements, materials, and methods of manufacture, American pumps assure even more efficient operation and trouble-free service. They are available in Deep Well Turbines, Double Suction, Two Stage Centrifugals, Single Stage Centrifugals with open or closed impellers, Axial and Mixed Flow, Sewage and Sludge.

These pumps are designed to perform properly within a definite range. We suggest, therefore, that you submit your pumping problem to our engineering staff. Their recommendation will be based upon wide installation experience and sound engineering practice.

DEEP WELL TURBINES

● ***Features:*** Deep bronze packing box, designed for high pressure with minimum leakage. Top line shaft bearing, located at top of column, eliminates whipping through packing box. Bronze enclosed impellers have uniform, hand finished water passages. Given final machining after assembly on shaft to insure correct running clearances and rotative balance.

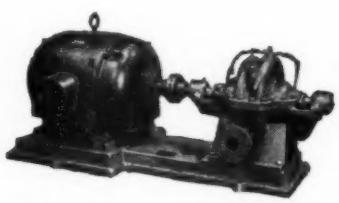
Send for Bulletin 245



DOUBLE SUCTION PUMPS

For a wide range of applications in general water supply. Split case, ball bearing design. Enclosed type bronze impeller with all water passages hand finished and exterior surfaces machined.

Send for Bulletin No. 248



TWO STAGE CENTRIFUGAL PUMPS

For water booster service. Split case design. Passage from first to second stage entirely within casing, reducing friction losses to minimum. Back-to-back, single suction, bronze enclosed impellers.

Send for Bulletin 246

AMERICAN WELL WORKS

In Our 79th Year
102 North Broadway
AURORA, ILLINOIS

Pumping, Sewage Treatment, and Water Purification Equipment
RESEARCH · ENGINEERING · MANUFACTURING

Offices: Chicago · New York · Cleveland · Cincinnati · Kansas City · Sales Representatives throughout the World

STAR PERFORMER

Since the first successful application of Activated Carbon in powdered form more than 15 years ago, AQUA NUCHAR has been a "star performer" in combating tastes and odors in raw water supplies.

It has been scientifically estimated that one cubic inch of AQUA NUCHAR offers a total external and internal surface of 20,000 square yards. Unwanted impurities are attracted and imprisoned by this vast surface area, much the same as a magnet draws iron filings to it. All of these impurities are retained in the Activated Carbon and subsequently are eliminated when the carbon is removed on the filter sand or by settling.

AQUA NUCHAR Activated Carbon has been used in over 1,200 water treatment plants throughout the country. If you are not a regular user, experts from our Technical Service Department are available to study your taste and odor problems at no cost or obligation. Write to our nearest office for complete information on AQUA NUCHAR Activated Carbon.

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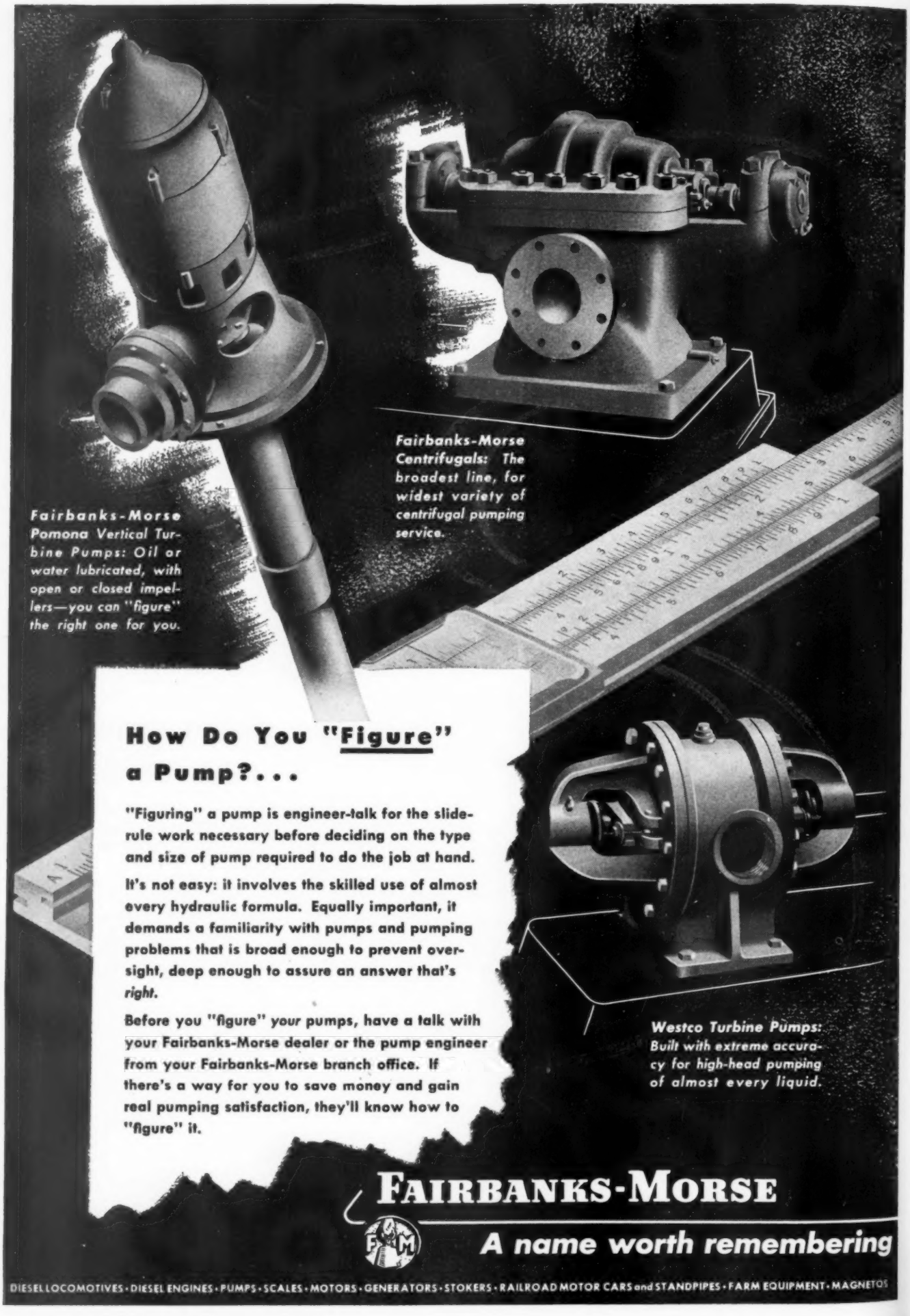
Fairbanks-Morse Pomona Vertical Turbine Pumps: Oil or water lubricated, with open or closed impellers—you can "figure" the right one for you.
Fairbanks-Morse Centrifugals: The broadest line, for widest variety of centrifugal pumping service.
How Do You "Figure" a Pump?...
"Figuring" a pump is engineer-talk for the slide-rule work necessary before deciding on the type and size of pump required to do the job at hand.
It's not easy: it involves the skilled use of almost every hydraulic formula. Equally important, it demands a familiarity with pumps and pumping problems that is broad enough to prevent oversight, deep enough to assure an answer that's right.
Before you "figure" your pumps, have a talk with your Fairbanks-Morse dealer or the pump engineer from your Fairbanks-Morse branch office. If there's a way for you to save money and gain real pumping satisfaction, they'll know how to "figure" it.
Westco Turbine Pumps: Built with extreme accuracy for high-head pumping of almost every liquid.
FAIRBANKS-MORSE
A name worth remembering
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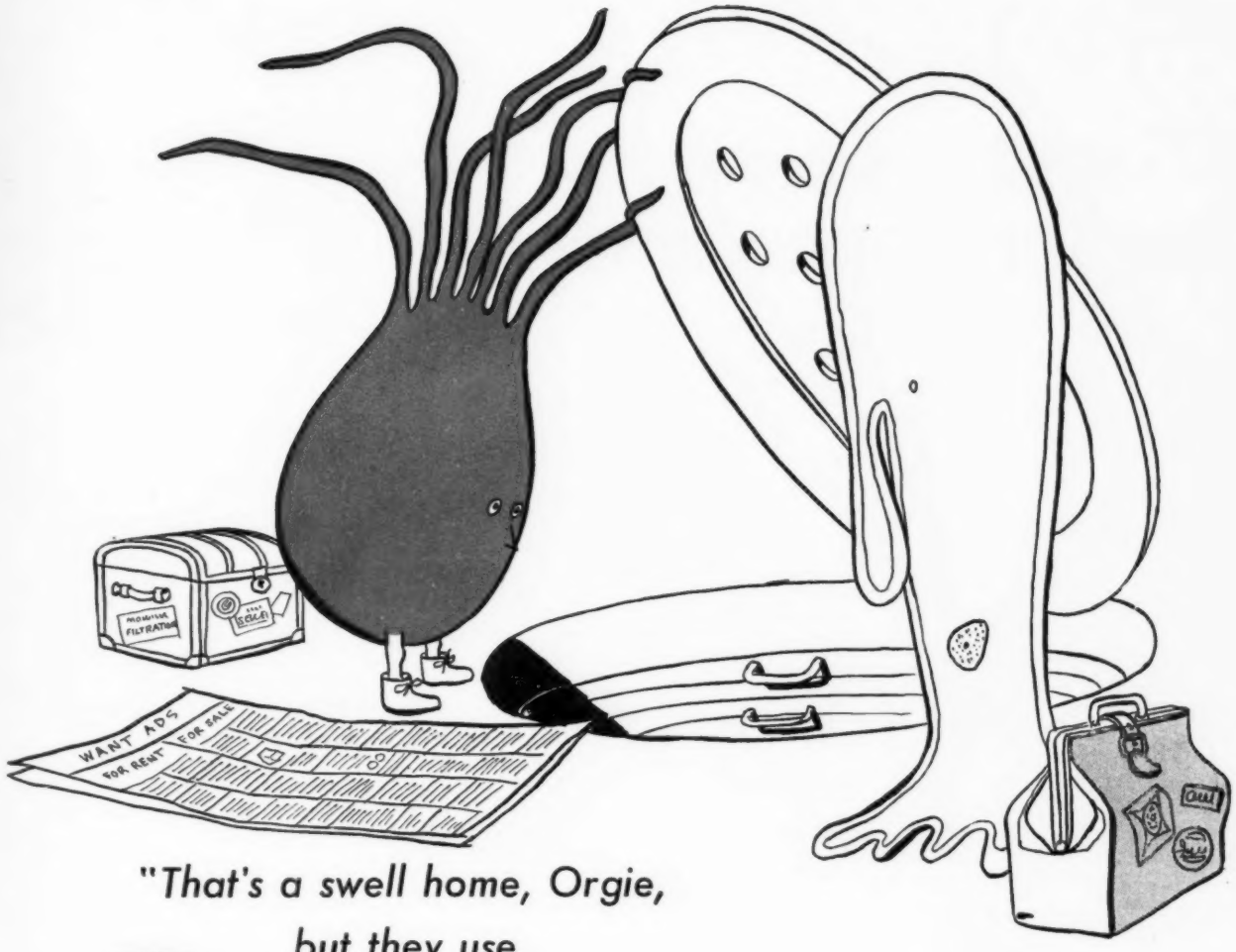
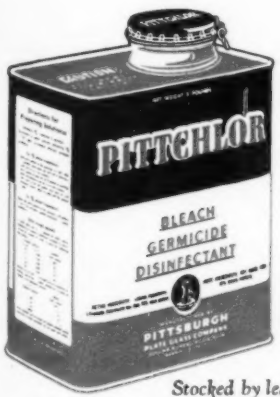


"That's a swell home, Orgie, but they use



*PITTCHLOR"

Winter or summer, chlorine-susceptible bacteria and algae find no relief from the deadly effects of Pittchlor. A high-test calcium hypochlorite with 70% available chlorine, Pittchlor is excellent for the chlorination of water supplies, the treatment of sewage, and for many general sanitation and deodorization purposes.

Pittchlor is easy to handle . . . dry, white, free-flowing . . . effective with either manual application or relatively simple mechanical feeders. Write for free literature covering the applications in which you are interested.

Stocked by leading jobbers —in 5 lb. resealable cans (9 per case), 3-¾ lb. cans (12 per case) and 130 lb. drums.

*Reg. U.S. Pat. Office

PITTSBURGH PLATE GLASS COMPANY, COLUMBIA CHEMICAL DIVISION, FIFTH AVENUE AT BELLEFIELD, PITTSBURGH 13, PA. · · · CHICAGO · BOSTON · CLEVELAND · NEW YORK · CINCINNATI · ST. LOUIS · MINNEAPOLIS · PHILADELPHIA · CHARLOTTE · SAN FRANCISCO

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PITTSBURGH PLATE GLASS COMPANY

A PROFIT OPPORTUNITY FOR SANITARY SERVICE OPERATORS

Here is important information for both community officials and sanitary service operators. It's the new Odorless Sanitary Cleaner, a complete self-contained mobile unit engineered especially for cleaning septic tanks, cisterns and vaults.

It eliminates all the disagreeable and unsanitary aspects of the job. It cuts to a small fraction the time required with old fashioned and makeshift equipment. (500 gal. septic tanks can be cleaned in 15 minutes). Operators can greatly improve working conditions, conform to all Board of Health regulations and materially increase profits.

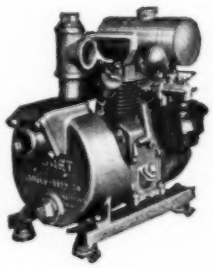
The unit is equipped with a powerful, centrifugal Gorman-Rupp sewage pump that is completely non-clogging and self-priming. It is provided complete with tank and all fittings ready to mount on standard truck chassis of 158 to 161 inches.

It represents an exceptional business opportunity in your community and no previous experience is required.

Write for complete information and literature

"HANDY" PUMP

An extremely useful and dependable pump that weighs only 20 lbs. Fitted with pipe or common garden hose it will lift up to 25 ft. and deliver 8 GPM at 40 lbs. pressure. Self - priming, electric motor driven.



THE "MIDGET"

Weighs only 60 lbs. yet pumps 3000 GPH at 20 ft. head, more than any other pump of the same weight Self-priming, husky. Trouble-free service.

Gorman-Rupp makes a complete line of self-priming centrifugal pumps ranging in capacity up to 125,000 GPH. Simplicity of design provides efficient, long and trouble-free service. A size and capacity to handle any pumping requirement.

THE GORMAN-RUPP COMPANY

Gorman-Rupp Pumps — Unsurpassed for Pumping Fast

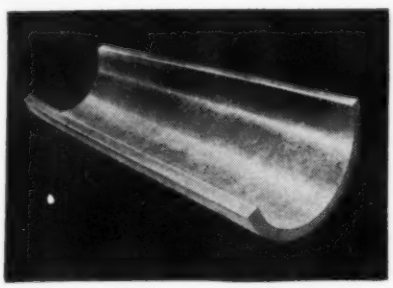
323 N. Bowman St. — **Mansfield, Ohio**

Engineering Facts about

Johns-Manville TRANSITE PRESSURE PIPE

Carrying Capacity

EXAMINATION of the interior wall of Transite* Pressure Pipe will quickly disclose its uniformly smooth surface. This smoothness, imparted during manufacture by forming each length under pressure on a highly polished steel mandrel, accounts for the high flow coefficient of Transite Pressure Pipe—C=140, based on the Williams and Hazen formula.



The unretouched photograph above shows Transite's exceptionally smooth interior surface—imparted by the polished steel mandrel on which the pipe is made.

Moreover, because Transite is made of asbestos and cement, it is inherently and completely immune to tuberculation. This means that the initial high carrying capacity of this pipe remains high in service—a fact which has been confirmed by accurate Pitometer tests.

One important advantage of Transite's maintained high carrying capacity is the assurance of an ample flow of water for both normal and fire-fighting needs in the years to come. Pumping equipment can be operated closer to peak efficiency; pumping costs can be held to a minimum. Taxpayers can receive the benefits of the favorable fire insurance rates which result from a modern, efficient water distribution system of ample capacity.

Accurate Pitometer tests conducted in the field verify Transite's maintained carrying capacity of C=140.

Another advantage—the engineer may design his water system with pipe of minimum diameter, rather than resort to larger pipe than would otherwise be necessary in order to offset the progressive reduction in flow caused by tuberculation. This practice is not necessary when Transite Pressure Pipe is specified.

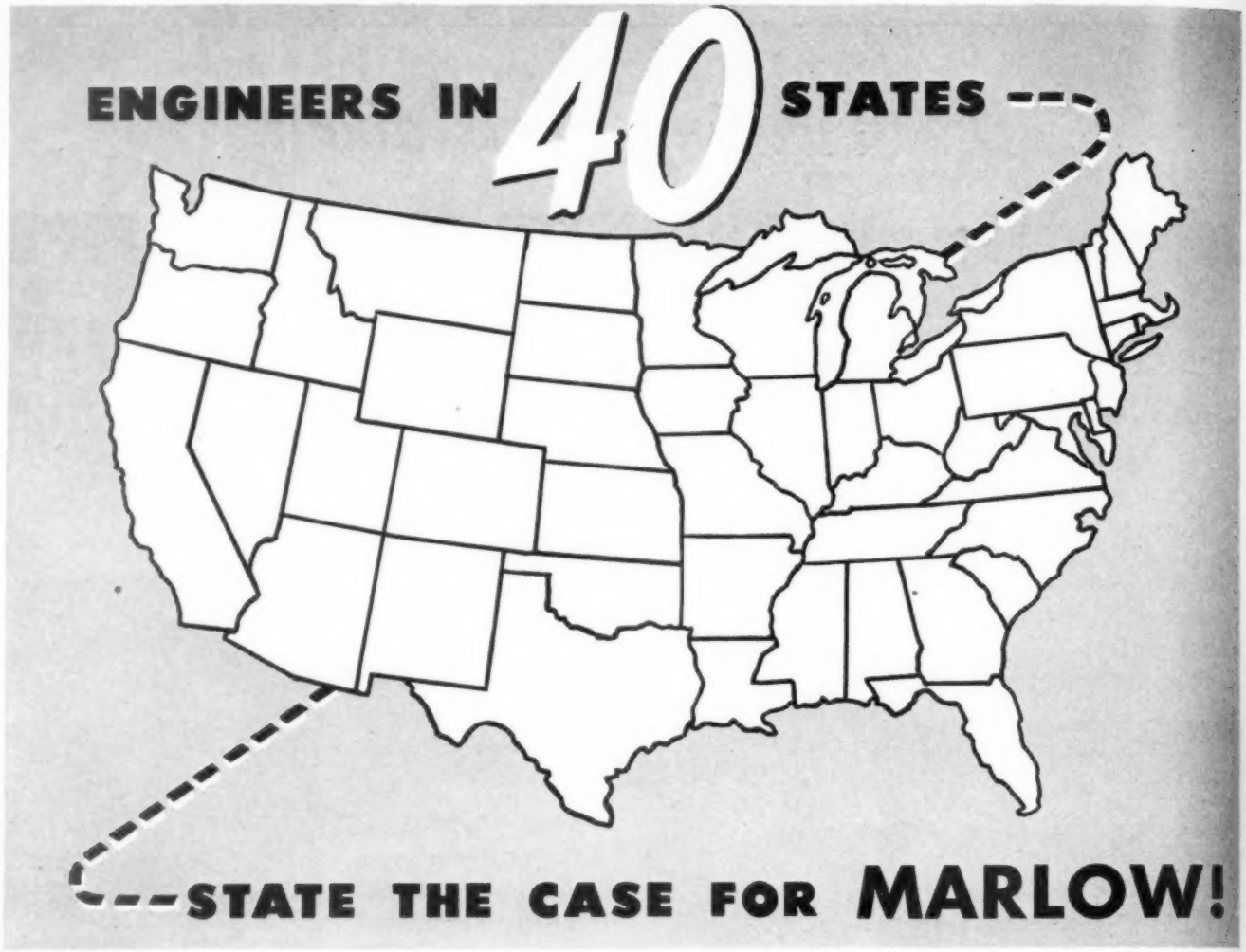
As indicated by tests, Transite's *maintained* carrying capacity helps provide the abundant fire-flow essential to adequate protection and to favorable fire insurance rates.

And, of course, since tuberculation is not a problem, the costly expense otherwise involved in cleaning and lining of water mains can be eliminated.

A maintained high-carrying capacity is one of many advantages of Transite—the modern asbestos-cement pipe that was engineered to carry water more efficiently and more economically. For further facts, write for Brochure TR-11A. Address Johns-Manville, Box 290, New York 16, New York.

*Transite is a registered Johns-Manville Trade Mark

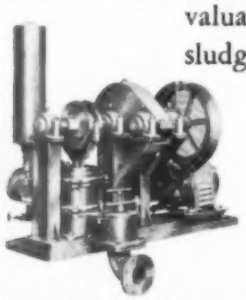
JOHNS-MANVILLE JM PRODUCTS



Let the record of Marlow acceptance speak for itself. Marlow Sludge Pumps are handling some of the most punishing pumping assignments from coast to coast—unfalteringly, year-in and year-out.

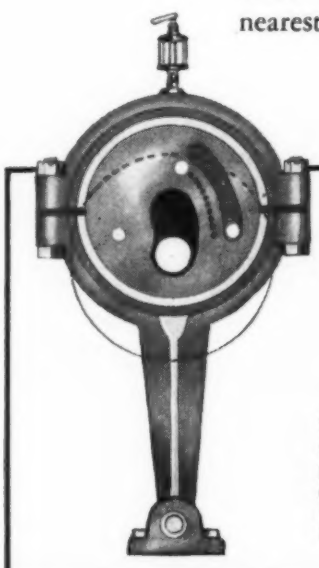
Marlow pumps are built to last a life-time, with attention and maintenance at a negligible minimum. And records of scores of sewage plants prove they do what they're built for.

Marlow pumps are being used to remove sludge from settling tank hoppers, to transfer materials from digestion tanks to storage units and sludge beds. Their positive pulsating action is proving particularly valuable in cutting the volume of sludge to be handled and brought to temperature in the transferring of material to heated digesters.



A Marlow Sludge Pump will move wastes so heavy as to be nearly solid. It will pass large quantities of bulky debris. It will not readily air-bind or gas-bind. It will operate efficiently under suction lifts as high as 20 feet.

For informative booklet on Marlow Sludge Pumps, or for details of the installations nearest you, write Marlow today.



ONE of the reasons a *Marlow* STANDS UP

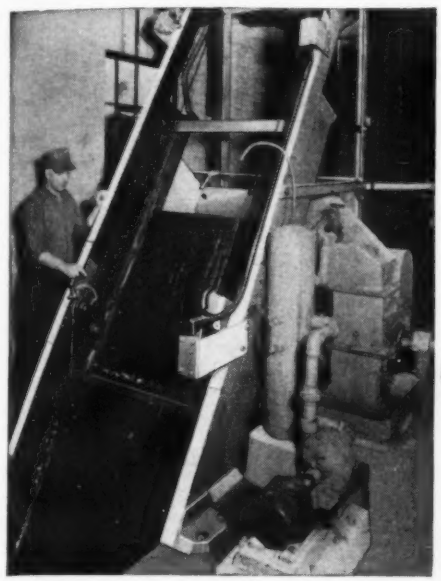
This is Marlow's extra-strong eccentric rod, made entirely in one piece to assure permanence of alignment. It typifies the construction details that add stamina to Marlow pumps.

MARLOW SLUDGE PUMPS

MARLOW PUMPS • RIDGEWOOD, NEW JERSEY

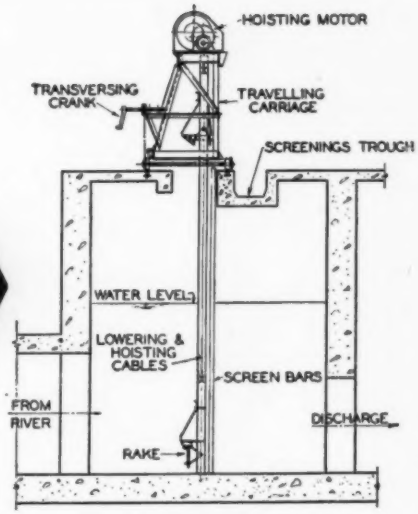
IS SCREENING LIQUIDS *YOUR PROBLEM?*

Link-Belt sanitary equipment engineers with their vast experience in screening liquids, are prepared to help you with your particular problems, and to recommend and supply the correct type, of coarse, medium or fine screen. Write or call our nearest branch office for detailed information on any of the following types of screens:



TRASH SCREENS

—for the removal of large floating particles from large volumes of water, for the protection of fine water screens or other water plant or power plant equipment.



TRASH SCREEN WITH MECHANICAL RAKE

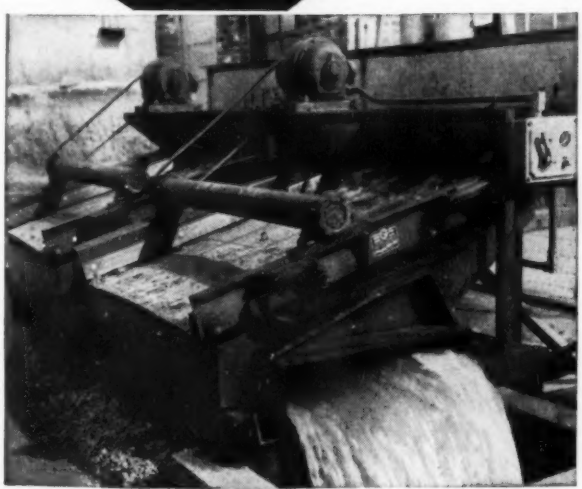
STRAIGHTLINE SCREENS

—for the removal of solids over ½ inch size from sewage or industrial liquids.

TRITOR SCREENS

—for the removal of both grit and floating solids or other detritus from waste waters.

VIBRATING SCREENS



—for the removal of fine solids from industrial liquids.

In addition to screens, Link-Belt Company manufactures a complete line of equipment for water, sewage and industrial waste treatment such as Straightline and Circuline sludge collectors, grit collectors and washers, mixers, scum breakers, aerators, dryers, power transmitting, elevating and conveying machinery. Send for catalogs.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8.
Offices in Principal Cities.

10 '43

LINK-BELT

SCREENS · COLLECTORS · MIXERS · AERATORS

PEOPLE TAKE SEWAGE DISPOSAL FOR GRANTED,

But.....

THE HEALTH AND SAFETY OF A COMMUNITY IS DEPENDENT ON EFFICIENT OPERATION OF ITS SEWAGE PLANT.

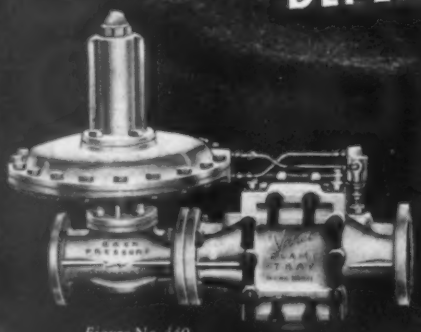


Figure No. 440

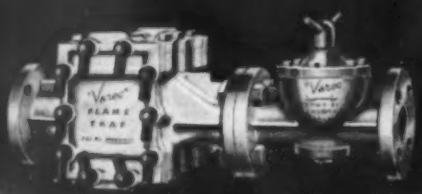


Figure No. 450.

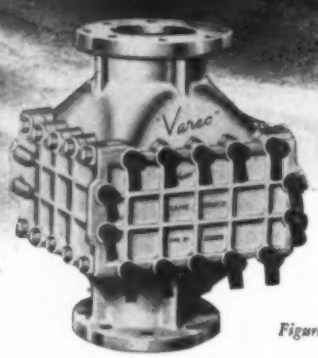


Figure No. 50A.

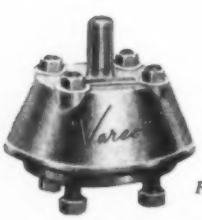


Figure No. 70

If you had to divert sewage gathering because of fire or explosion in the plant, you can readily imagine the catastrophic results. The best insurance is proper fire prevention. With inflammable sewage gases, this means adequate and dependable safety devices that are designed to prevent flame propagation and explosion. Each of the "VAREC" Approved Safety Devices shown below has a definite place in your plant. Whether you are designing a new sewage treatment plant or surveying an old one for fire hazards, insist that dependable "VAREC" Safety Devices be used.

FIGURE 440 "VAREC" *Approved* PRESSURE RELIEF AND FLAME TRAP ASSEMBLY

Consists of Super-Sensitive diaphram-operated Back Pressure Regulator, Flame Trap and Thermal-Controlled Regulator Shutoff Valve. Usually installed in waste-gas line, just upstream of Waste-Gas Burner.

FIGURE 50A "VAREC" *Approved* FLAME TRAP ASSEMBLY

Consists of a Flame Trap and Thermal-Operated Shutoff Valve. Usually installed in all gas lines supplying gas utilization equipment and in line to gas holder and between multiple digestors.

FIGURE 50A "VAREC" *Approved* FLAME ARRESTOR

Allows full flow of gas, yet prevents flame propagation by means of multiple-aluminum-plate grid. Usually installed between digester dome and Pressure-Vacuum Breaker Valve.

FIGURE 70 "VAREC" *Approved* EXPLOSION RELIEF VALVE

Dissipates accumulating pressure waves which travel ahead of actual combustion. Usually installed at top of vertical riser upstream of any source of combustion. Can also be used as an auxiliary pressure relief on digester and gas holder domes.

OTHER "VAREC" *Approved* SEWAGE GAS CONTROL EQUIPMENT

Pressure Relief and Vacuum Breaker Valves—Pressure Reducing Regulators—Back Pressure Regulators—Back Pressure Regulators—Flame Checks—Waste Gas Burners—Manometers—Sediment Traps—Drip Trap Assemblies.

All "VAREC" Sewage Equipment is fully described in the "VAREC" S-3 Catalog. Write for your copy today.

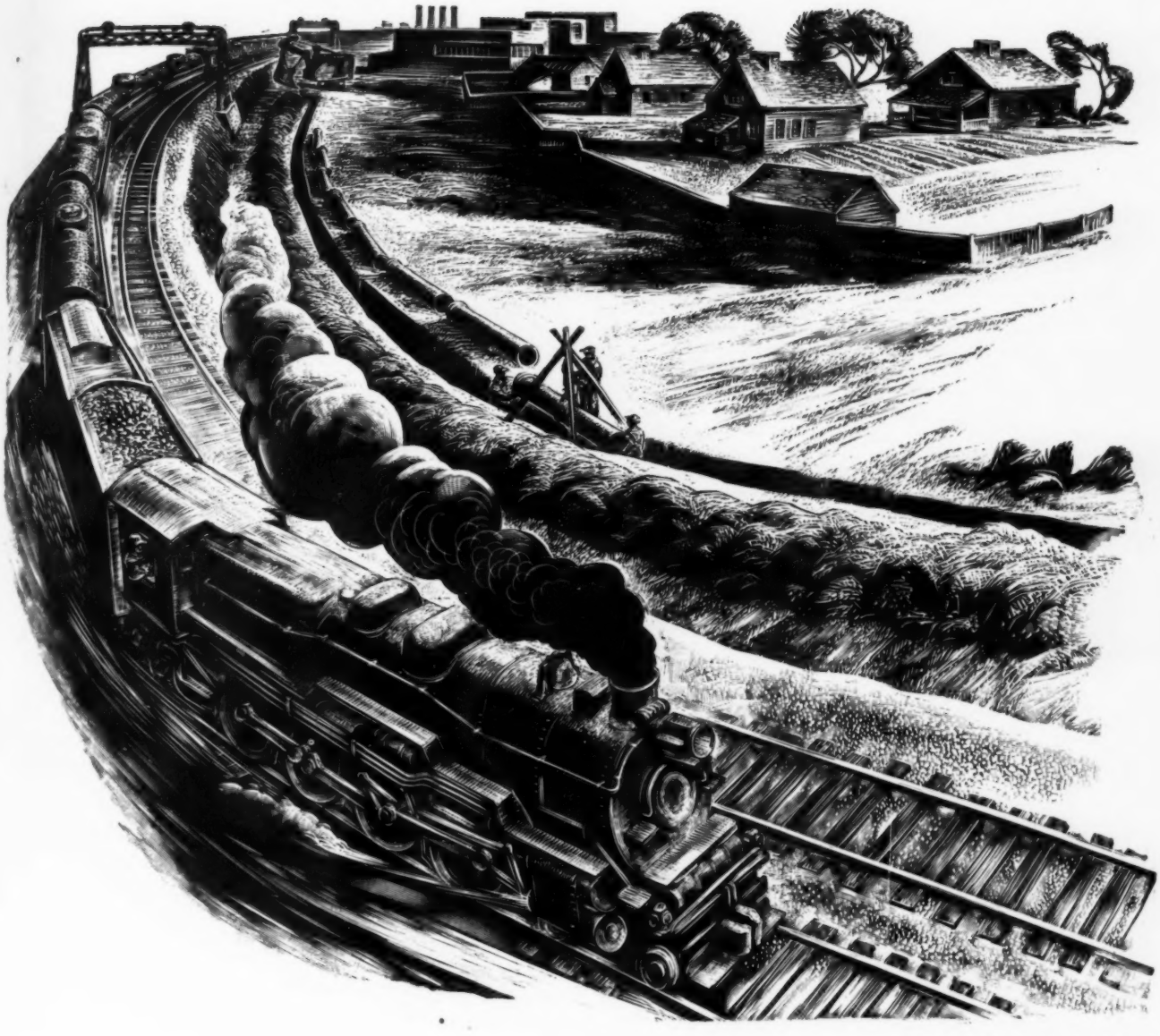
THE VAPOR RECOVERY SYSTEMS COMPANY

COMPTON • CALIFORNIA • U. S. A.

New York City—Chicago, Ill.—Cleveland, O.—Houston, Tex.—Tulsa, Okla.
Cable Address VAREC COMPTON (all codes)

THE PACE SETTER SINCE 1928

18-5

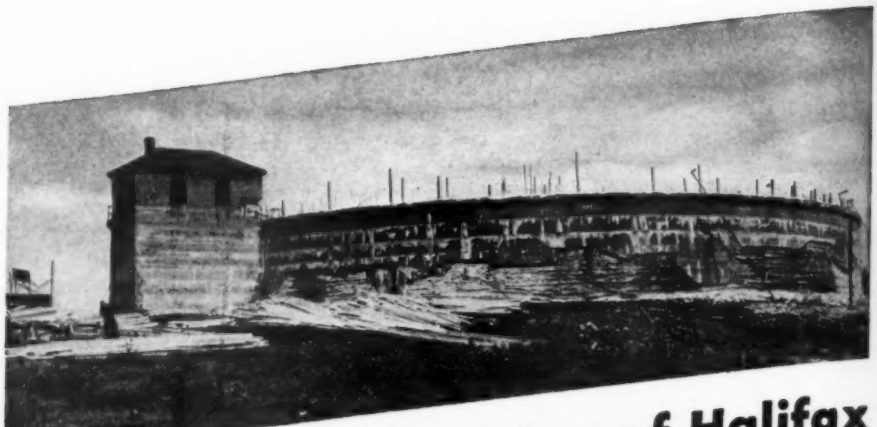


Original Woodcut by Lynd Ward

Headquarters for cast iron pressure pipe—pit cast or centrifugally cast—large or small diameter—for water, gas, sewerage, industrial and railroad service. Five plants, including a specialized plant for the manufacture of fittings, are at the service of buyers of U. S. Cast Iron Pipe. Nearly a half-century of experience in pipe design is the background of our technical staff. You are invited to draw on their knowledge and experience in connection with any pipe problem you may have, without obligation.

U.S. cast iron PIPE

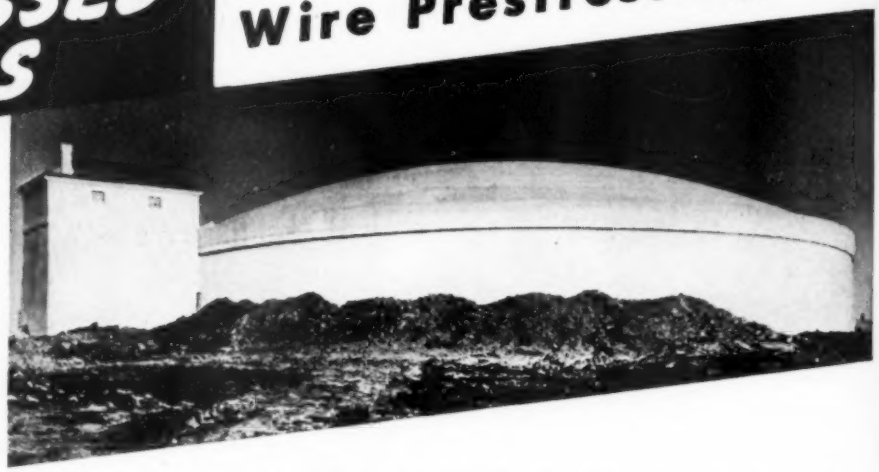
U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout U.S.A.



Halifax, N. S. reservoir before rehabilitation.

PRELOAD PRESTRESSED DOMES

Rehabilitation of Halifax Reservoir With Preload Wire Prestressing . . .



Reservoir after rehabilitation, showing Preload Prestressed Dome.

Reconstruction of the 3½ million gallon Halifax, N. S. reservoir by Preload Company of Canada Ltd. (Subsidiary of The Preload Corp. of New York) and Canada Gunite, Ltd., plus the addition of 500,000 gallons new capacity, has been carried out by the use of PRELOAD WIRE PRESTRESSING on the dome ring which carries the load of the new dome roof, the largest of its kind ever built, (164 ft. 3 in. diameter). 42 miles of 0.162″ high tensile (200,000 psi.) strength wire was applied by the PRELOAD WIRE PRESTRESSING MACHINE at an initial stress of 140,000 psi. The wire was applied in five layers, each layer of wire being bonded with a coating of gunite and the entire ring being finished off with a one inch gunite cover coat. (See articles in June '47 Journal of American Water Works Association and Aug. 7, 1947 Engineering News-Record).

This reservoir, built in 1913, represented a serious problem caused by erosion and spalling due to ice action and severe winter weather conditions. The availability of materials for this type of reconstruction, (to meet an urgent time factor) and substantial economies over other methods of rehabilitation, all made it possible for PRELOAD to demonstrate the same economy and freedom from long-term maintenance costs which characterizes PRELOAD'S construction of new tanks and other circular structures.

Send for Bulletin.

THE PRELOAD COMPANIES

420 LEXINGTON AVE., NEW YORK, N. Y.

Designers and Builders of Prestressed Concrete Storage Tanks and Pressure Pipe
Prestressed Concrete Bridges and Cement Lining of Pipe in Place

The Preload Corporation
New York—Boston—Washington

Preload Central Corporation
St. Louis—Chicago—Kansas City

PRELOAD TRADE MARK

Preload Pacific Corporation
San Francisco—Los Angeles

The Preload Co. of Canada, Ltd.
Montreal—Toronto—Halifax

he accuracy and versatility of many pH instruments
are limited by the electrode system – *BUT NOT BECKMAN EQUIPMENT!*

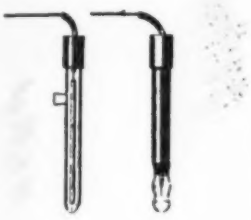
...THE INDUSTRY'S MOST COMPLETE LINE OF MODERN pH ELECTRODES IS AVAILABLE FOR USE WITH BECKMAN pH INSTRUMENTS

REMEMBER THIS important fact about modern pH equipment—glass electrode pH instruments are the most advanced and efficient type of pH equipment obtainable. *But no glass electrode instrument is better than the versatility, accuracy and dependability of the electrode assemblies available for use with it.*

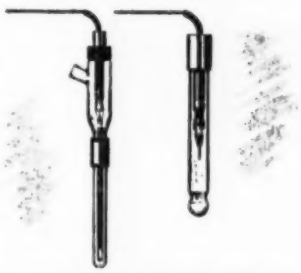
And that is another of the many vital advantages that are yours when you select BECKMAN pH Instruments—for Beckman, *pioneer of modern glass electrode pH equipment,* not only provides the finest and most advanced pH instruments, but also the industry's most complete line of electrodes for use with these instruments.

Illustrated below are only a few of the more than 90 different types of interchangeable Beckman pH Electrodes that assure maximum accuracy, convenience and wide-range adaptability to users of Beckman pH Meters—the pH instruments that are the recognized standard of the industry.

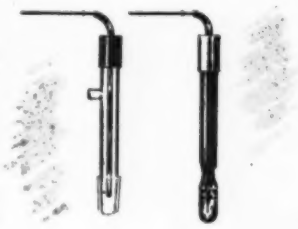
No matter what your pH problem, there is a Beckman pH Instrument and a Beckman Glass Electrode assembly to meet your exact requirements for both industrial and research applications. So why restrict your operations with anything less than the *complete* pH facilities provided by Beckman?



HIGH pH GLASS ELECTRODES. Pioneered by Beckman, these glass electrodes permit accurate measurement of high pH solutions with negligible error *even in the presence of sodium ions.* Ideal for use on detergents, soaps and many other applications where regular glass electrodes are useless.

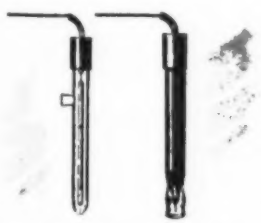


HIGH TEMPERATURE GLASS ELECTRODES. Another development pioneered by Beckman, these electrodes can be used directly in high temperature process solutions to 100° C. (212° F.) without damage. Eliminates special sampling devices and greatly simplifies control of hot processing solutions.

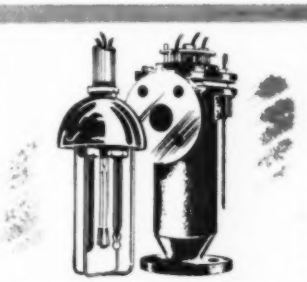


RUGGED DUTY GLASS ELECTRODES. Still another Beckman development, these electrodes are specially designed for direct immersion in tanks and flow lines where abrasion is severe (paper pulps, ore slurries, etc.). Not only abrasion resistant, but also withstand more than 100 lbs. pressure on immersion end.

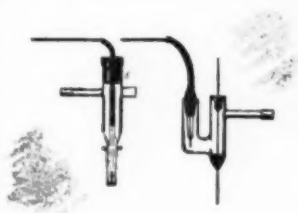
PENETRATION TYPE GLASS ELECTRODES. The pointed application end greatly simplifies direct pH measurements of cheeses, fish, fruits and similar semi-solids where penetration of outer surface is desired for internal pH measurements.



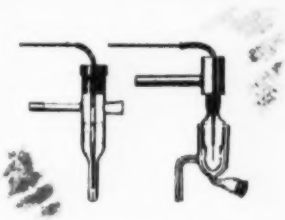
SURFACE TYPE GLASS ELECTRODES. On these Beckman electrodes the application end is nearly flat in order to simplify pH measurements on skin, hides and moist surfaces of materials where pH measurements of outer surfaces are desired.



IMMERSION AND FLOW TYPE ASSEMBLIES. Can be placed directly in flow lines, vats, tanks, etc., to permit direct and continuous pH measurements on process solutions. Far simpler, quicker and more accurate than sampling devices. Can be used with various types of Beckman electrodes.



MICRO GLASS ELECTRODES. One of dozens of specialized Beckman pH electrodes for science and laboratory investigations. This type permits quick, convenient and accurate pH measurements on samples of less than one drop.



HYPODERMIC GLASS ELECTRODES. One of many specialized Beckman pH electrodes for medical use. In this type, 0.5 ml blood samples can be injected from hypodermic needle through membrane with minimum exposure to air. Other types are also available.

THE ABOVE ARE ONLY TYPICAL **of the wide selection of glass electrodes available for use with Beckman pH Instruments . . . one more reason why Beckman pH Instruments are recognized throughout the world for their dependability, accuracy and versatility.** ***Beckman Instruments, National Technical Laboratories, South Pasadena 20, Calif.***

INSTRUMENTS CONTROL MODERN INDUSTRIES

R-S valvEvents

ISSUED PERIODICALLY BY R-S PRODUCTS CORPORATION, PHILADELPHIA 44, PA., FOR THOSE CONCERNED WITH FLOW CONTROL AND SHUT-OFF

D. W. (Dave) HOPKINS
Executive Vice President

Announcement is made of the appointment of David W. Hopkins, widely known consulting engineer, as Executive Vice President of R-S Products Corporation. Hopkins has previously been Vice President and since 1939 in charge of the Valve Division of R-S Products.

Earlier in his career he served as consulting engineer and Vice President of V. E. Montgomery Company, Cincinnati, Ohio, where he specialized in processing and mechanical engineering.

After his graduation from Hughes High School, Cincinnati, in 1912 and the University of Pennsylvania in 1916 (mechanical engineering), he did post-graduate work in aeronautical engineering at the Massachusetts Institute of Technology.

(photo by Fabian Bachrach)

Noteworthy also in his background is extensive research at the University of Pennsylvania, with Professor W. S. Pardoe — resulting in many basic advances in valve construction and performance.

Mr. Hopkins was a Navy Pilot (USNR) in World War I and in his college days an All-American left end for three seasons.

Other Changes at R-S Products

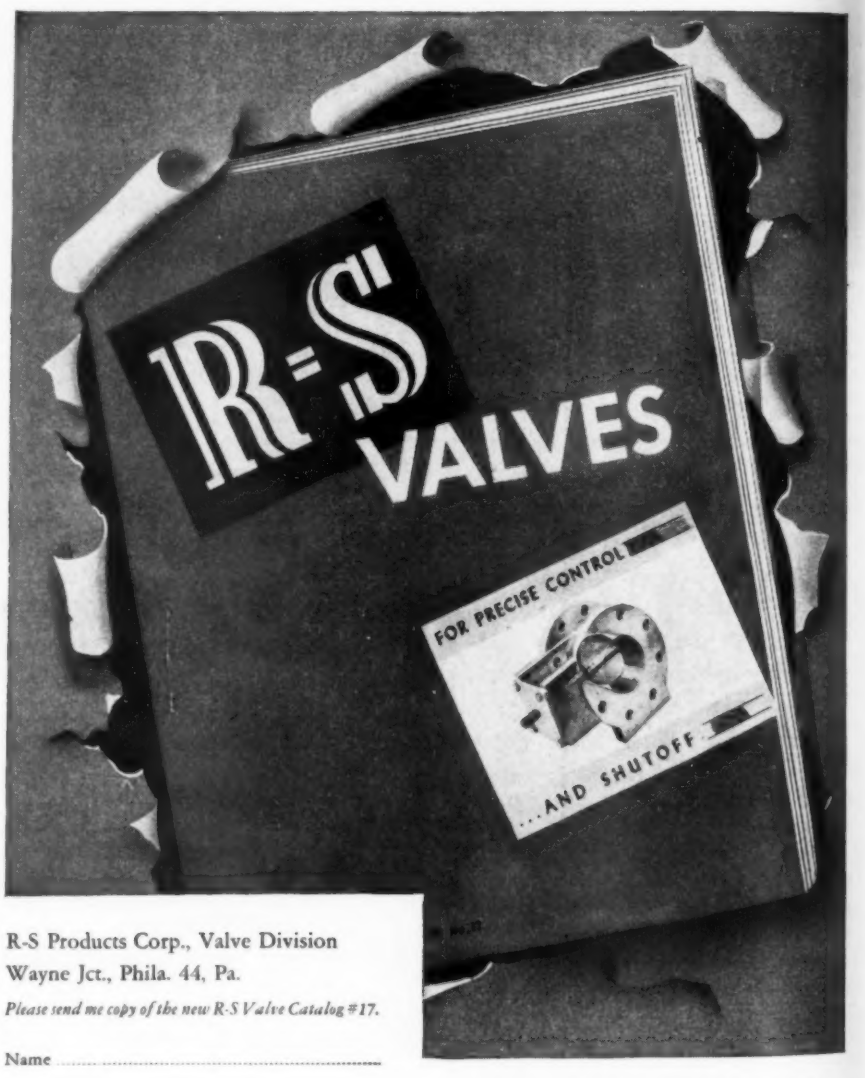
Russell C. Ayers has been named Sales Manager of the Valve Division. George B. Crawford has been named Chief Engineer of the Valve Division.

Both men have been with R-S for several years and have done a handsome job both for customers and distributors, for which the new titles and enlarged responsibilities are a just reward.

Excelsior!

JMLeoP-L2

Send for YOUR copy of the NEW R-S Valve Catalog No. 17!



R-S Products Corp., Valve Division
Wayne Jct., Phila. 44, Pa.

Please send me copy of the new R-S Valve Catalog #17.

Name .....

Title ..... Company .....

Street ..... Zone .....

City ..... State .....

Fully descriptive, generously illustrated; includes *complete* dimensional data on *all* R-S Valves. Write, wire, or phone:

R-S PRODUCTS CORPORATION
Wayne Junction, Philadelphia 44, Pa.

Digester tanks aren't usually planned for periodical inspection. Once put in service, they operate constantly till trouble forces a shutdown. The longer they run, the better for all concerned—and that's where Byers Wrought Iron pipe comes in!

The heating coils in digester tanks must take a terrific beating. Corrosive action increases as the temperature rises. (Some authorities estimate that the corrosion rate is doubled for each 20° F. rise in temperature). Then, too, sludge tends to collect on the surface of the pipe, and under high temperatures it decomposes and liberates highly corrosive compounds. All this means that the digester coils must have an unusually high degree of resistance to corrosion.

Byers Wrought Iron pipe is serving in this punishing service in plants all over the country. Its superior resistance to the unusually severe corrosive attack has been demonstrated over and over again.

The reason for this excellent performance is found in the unique composition and structure of wrought iron. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack, and so discourage pitting. They also help anchor the initial protective scale, which shields the underlying metal.

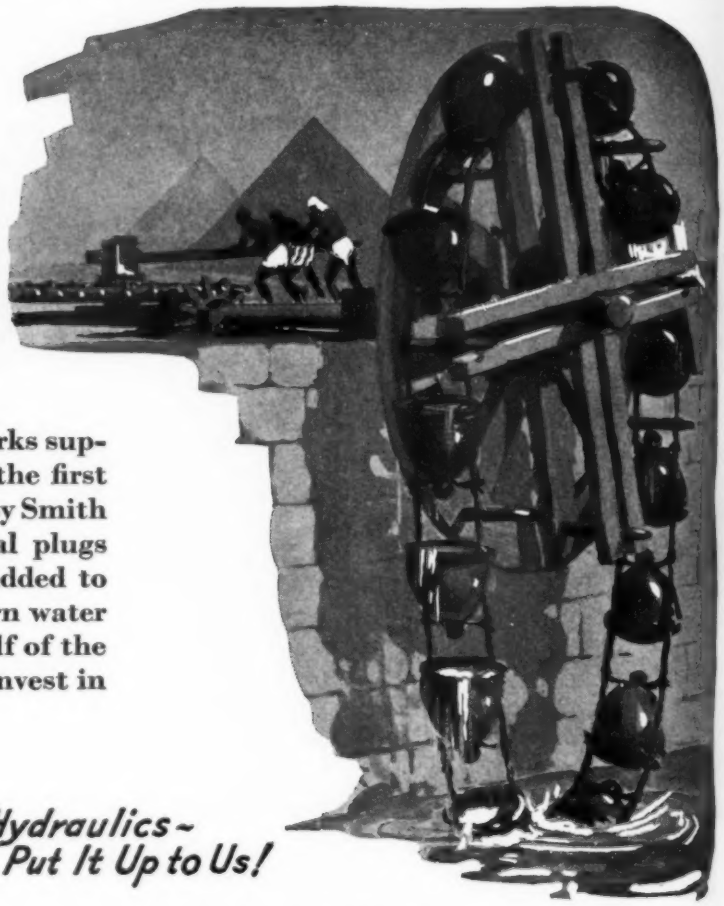
You will find some helpful information on the application of corrosion-resisting materials in our bulletin, "Wrought Iron for sewage treatment and disposal installations." May we send you a copy?

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

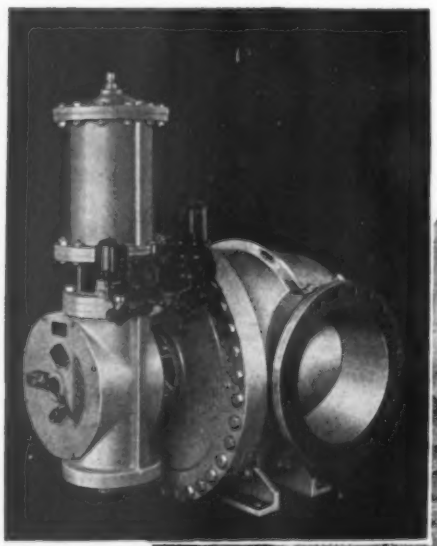
CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS
GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

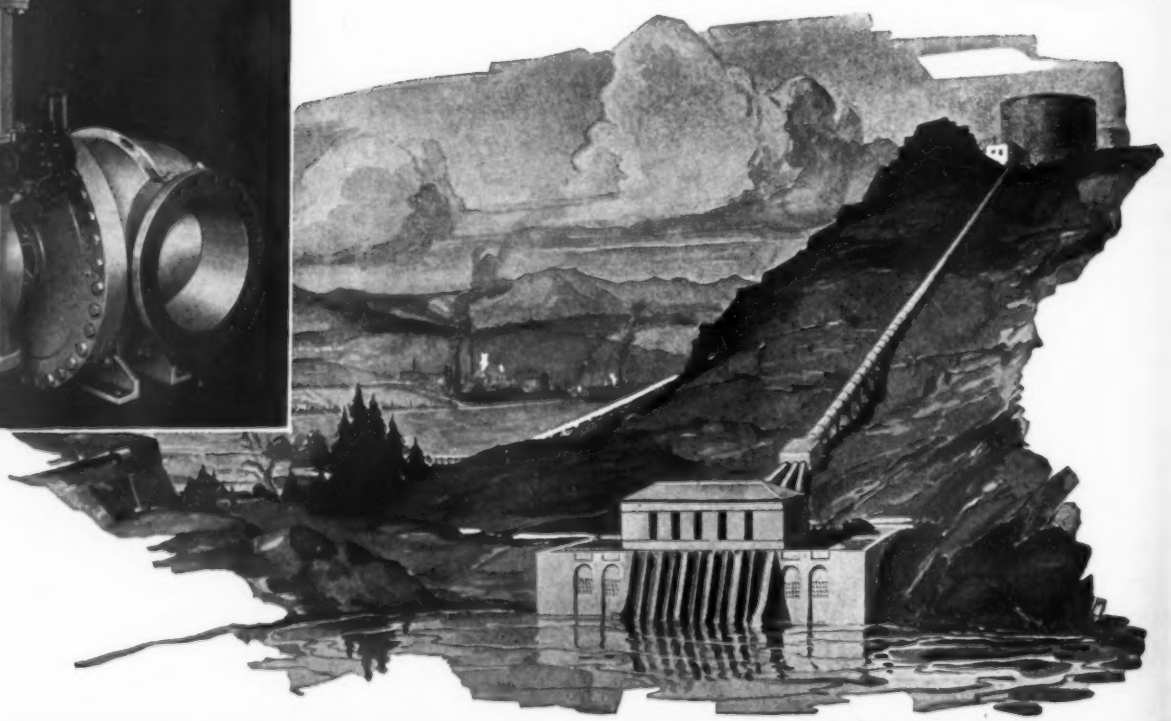
Modern WATERWORKS *possible with* Rotovalves *by* SMITH



MOVING ever onward, the huge water works supply systems of today have evolved from the first crude inventions of antiquity! Rotovalves by Smith with their full circular openings, conical plugs and electrically welded seat rings have added to the efficiency and reliability of the modern water works and sewage systems. Assure yourself of the utmost return on your Valve Dollar and invest in Rotovalves. Write for our bulletin.



If It's Hydraulics— Put It Up to Us!



S. MORGAN SMITH Co.

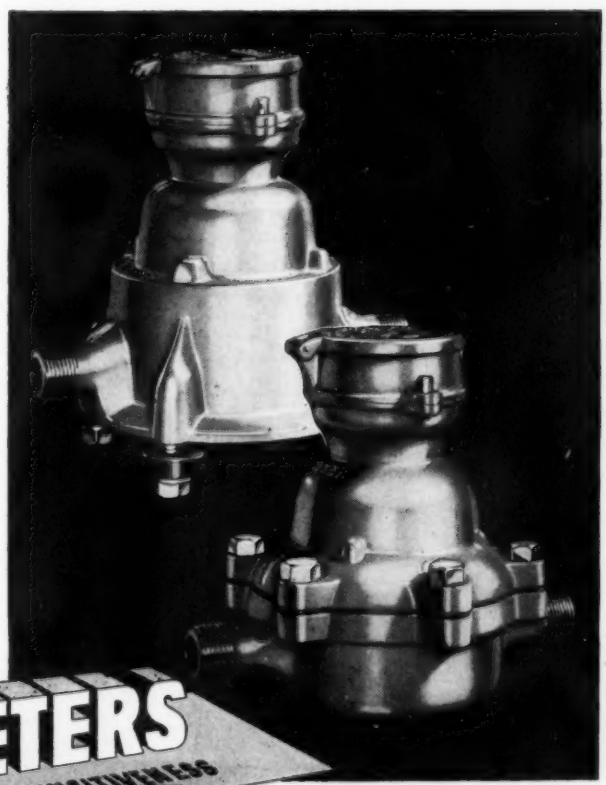
YORK, PENNA. U.S.A.

"Their accuracy practically paid for the cost of Badger Meters in 6 months"

. . . that's what the secretary of an eastern city's water company wrote, adding that "we are working for the time when all service connections will be metered."

It pays to BUY BADGER. For every waterworks service, there's a Badger size and type, unmatched in precision-construction, durable materials, and sustained accuracy, at lowest operating cost.

BADGER METER MFG. CO., MILWAUKEE 10, WIS.



BADGER METERS

ACCURACY · LOW COST MAINTENANCE · DURABILITY · SENSITIVENESS

BRANCH OFFICES:

NEW YORK CITY • PHILADELPHIA • WORCESTER, MASS.
SAVANNAH, GA. • CINCINNATI • CHICAGO • KANSAS CITY, MO.
WACO, TEX. • SALT LAKE CITY, UTAH • PORTLAND, ORE. • SEATTLE, WASH. • LOS ANGELES

Announcing

A NEW SERVICE TO THE WATER AND SEWAGE TREATMENT FIELD

FOR SPECIFIC EXAMPLES OF STUART CORPORATION SERVICE:—

1. One city wanted a surface wash system. We delivered and INSTALLED a Palmer surface wash system in five weeks.

2. Another city wanted four hydraulic valves promptly, together with tapping sleeves and valves of various sizes to 30". These were promptly shipped.

3. Another city wanted a quotation on a 16" main-line propeller type meter. The quotation was delivered by telephone same day.

4. Another city wanted two automatic water samplers, installed in electric refrigeration units, for determining character of water around the clock. These are being built.

5. Another city desired truck delivery of activated alum to handle an unusual raw water. They required over 300 tons to get by this emergency. This service is routine.

6. A large city required more water thru its plant. Kwik-way Flocculation equipment and Palmer surface wash system, along with adjustable baffle walls and extra chlorination equipment, did this job.

7. A big steel mill wanted more water thru existing pressure filters. Palmer agitators were designed into this plant. Six repeat orders since.

8. A State institution required new filter medium. Quick-washing anthrafilt was selected for this job and new one-piece brass umbrella type filter strainers were installed.

9. A large paper mill had trouble getting enough water thru its existing filter equipment. Non-packing Anthrafilt was substituted for sand and a Palmer surface wash system installed.

After years of exciting experiences in development and research programs in the water and sewage works fields it has been proven that certain fundamental items are essential in the design, construction and operation of these treatment works — manufactured by many reputable concerns — each concern generally furnishing a single item or possibly several.

For the convenience of those designing, constructing and operating water or sewage treatment works the Stuart Corporation, in addition to the several items of its own manufacture, has brought together a group of reputable old line firms —which furnish all the fundamental items necessary to build and operate plants of standard design.

With this new service Stuart Corporation requests your patience in response to quotations—as several days are required to prepare the kind of quotation which will assure the maximum economy and saving.

BIDS ON CONTRACTORS AND ENGINEERS REQUIREMENTS

FOR SLUICE GATES — FILTER SAND AND GRAVEL — CLARIFIERS — THICKENERS — WATERMAIN CLEANING AND LINING — AUTOMATIC SLUDGE REMOVAL EQUIPMENT — AUTOMATIC BACKWASH FILTERS — RUBBER FLIGHT CONVEYING EQUIPMENT — DIGESTERS — SCUM REMOVAL EQUIPMENT — POROUS PLATE FILTER BOTTOMS — HYDRAULIC VALVES — ETC., ARE OFFERED AT DEFINITE SAVINGS — INCLUDING THE FAMOUS ACTIVATED ALUM AND BLACKALUM.

Whatever your requirements for routine water and sewage treatment design—construction and operation—Stuart Corporation will consider it a privilege to offer its quotations and suggestions at no obligation.

Twenty-three years of continuous service to the water and sewage works field is your assurance of absolute dependability of products presented by Stuart Corporation.

(STUART CORPORATION FURNISHES FUNDAMENTALS)

America's Most Popular Water Works Products

MAKES WATER BRIGHT

STUART CORPORATION BALTIMORE

ACTIVATED ALUM
BLACKALUM
PALMER SURFACE WASH SYSTEMS

Kwik-Way Mixers

STUART CORPORATION · 516 N. CHARLES ST., · BALTIMORE 1, MD.

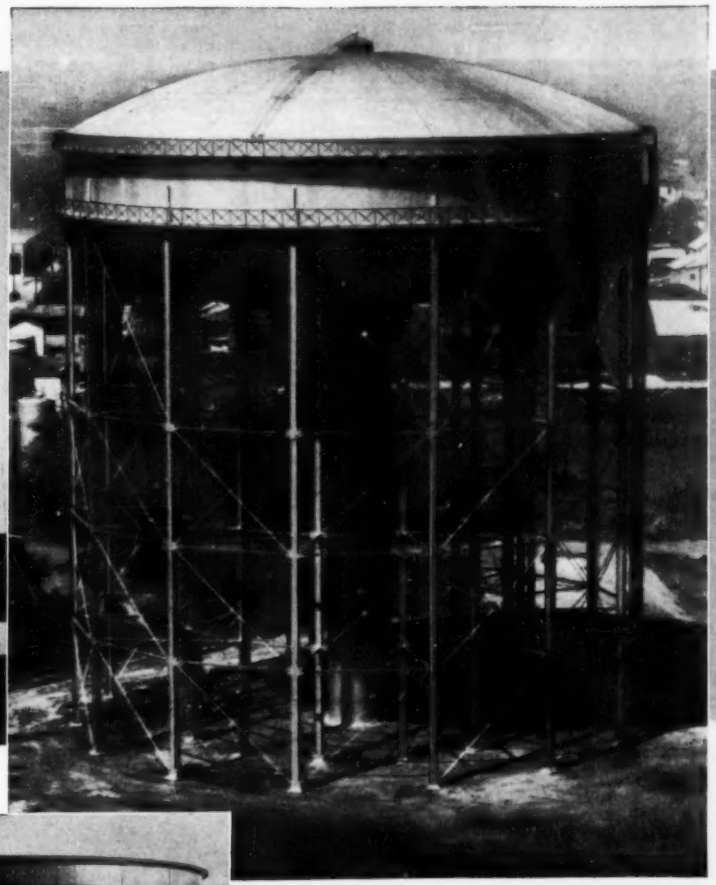
Long-Term Assets to the Modern Waterworks System . . . . .

for EFFICIENT SERVICE · LOWER MAINTENANCE · GREATER DURABILITY

Pittsburgh · Des Moines

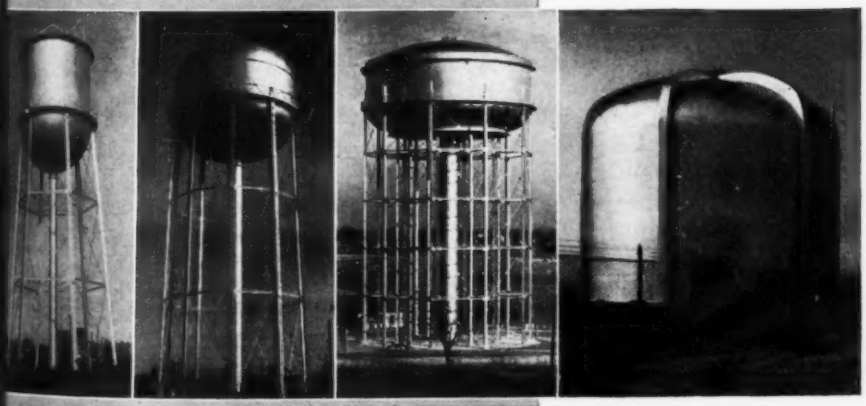
ELEVATED STEEL TANKS

and STEEL RESERVOIRS



1,500,000 gal. toroidal bottom tank; structural tower. Diameter 103'4", head range 25'; height to bottom 85'. Fort Dodge, Iowa.

Two 3,000,000 gal. steel reservoirs, diameter 144', height 25'. Berryville, Va.



,000 gal. cone ..., hemispherical ...tion tank, 110' to ... Stillwater, Okla.

500,000 gal. double ellipsoidal tank, on 100' tower. Mission, Texas.

1,000,000 gal. toroidal bottom tank; diameter 76'9", height 127', head range 30'. Keokuk, Iowa.

2,200,000 gal. steel reservoir; ellipsoidal roof; ornamental pilasters. Diameter 80', height 51'. Midland, Tex.

The choice of elevated steel tank or steel reservoir depends largely upon local land elevations. The choice of PITTSBURGH-DES MOINES as designers, fabricators and erectors of your required units is equally logical: you benefit by a half-century of experience in this type of construction, and a guarantee of complete satisfaction with each installation. *May we consult on your water storage needs?*

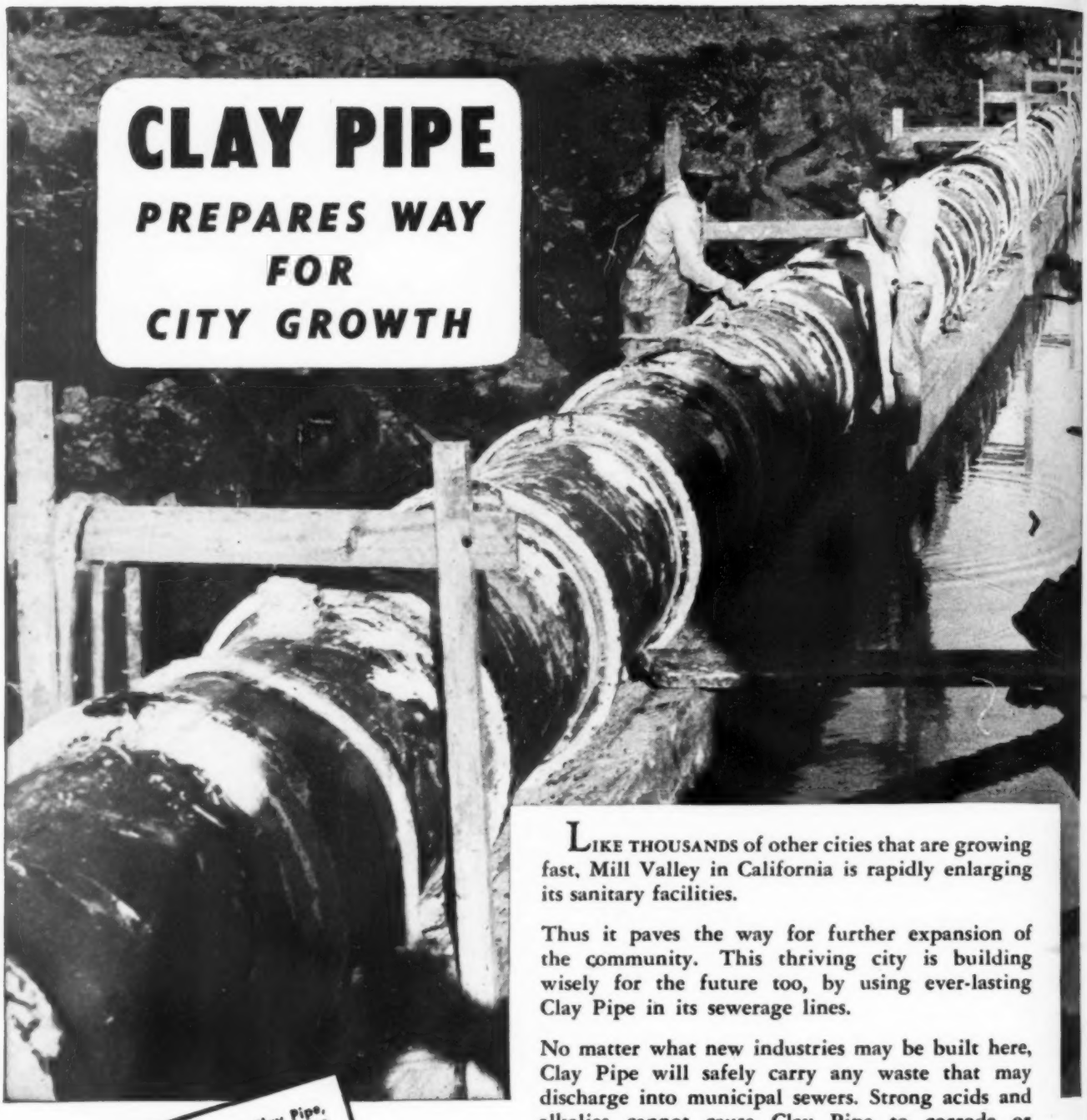
A NEW PITTSBURGH · DES MOINES STEEL FABRICATING PLANT at SANTA CLARA, CALIFORNIA

PITTSBURGH · DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH.....3418 Neville Island
NEW YORK.....Room 918, 270 Broadway
CHICAGO.....1222 First National Bank Building
DES MOINES.....919 Tuttle Street
DALLAS.....1223 Praetorian Building
SEATTLE.....526 First Avenue, South
SANTA CLARA, CAL.....625 Alviso Road



CLAY PIPE
PREPARES WAY FOR CITY GROWTH

3½ miles of Vitrified Clay Pipe, for large lines up to 30 inches in size as well as small lines, is being installed at Mill Valley, Calif. for a municipal sewerage line. Much of the line is below the normal water table. Depth ranges from 8 to 17 feet. Consulting engineer is John S. Bates. Contracting firm is McGuire and Hester. Robert Baumberger is City Manager of Mill Valley.

LIKE THOUSANDS of other cities that are growing fast, Mill Valley in California is rapidly enlarging its sanitary facilities.

Thus it paves the way for further expansion of the community. This thriving city is building wisely for the future too, by using ever-lasting Clay Pipe in its sewerage lines.

No matter what new industries may be built here, Clay Pipe will safely carry any waste that may discharge into municipal sewers. Strong acids and alkalies cannot cause Clay Pipe to corrode or crumble. Use of this durable material is a wise and lasting investment. It is the best insurance against costly and health-endangering breakdowns.

If you need specific information on a Clay Pipe problem, write the details to the office nearest you.

NATIONAL CLAY PIPE MANUFACTURERS, Inc.

522 First National Bank Bldg., Atlanta 3, Ga.
1105 Huntington Bank Bldg., Columbus 15, Ohio
111 W. Washington St., Chicago 2, Ill.
703 Ninth and Hill Bldg., Los Angeles 15, Calif.

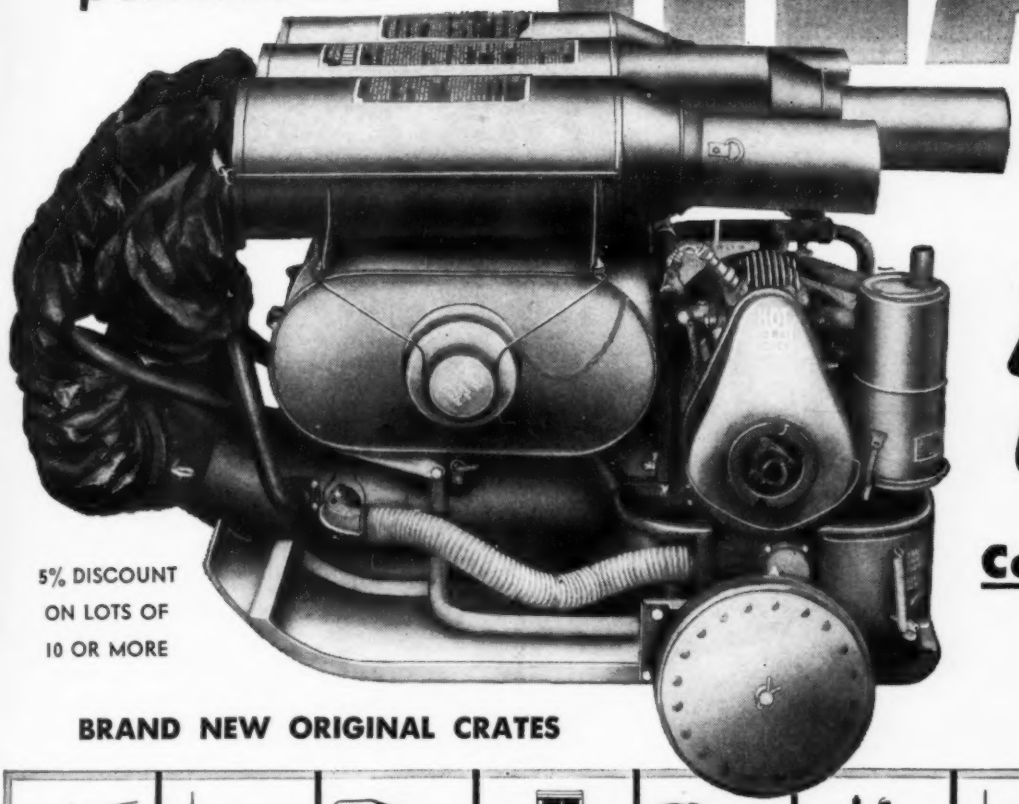
CLAY PIPE

CLAY PIPE NEVER WEARS OUT!

C-517-1

HEAT

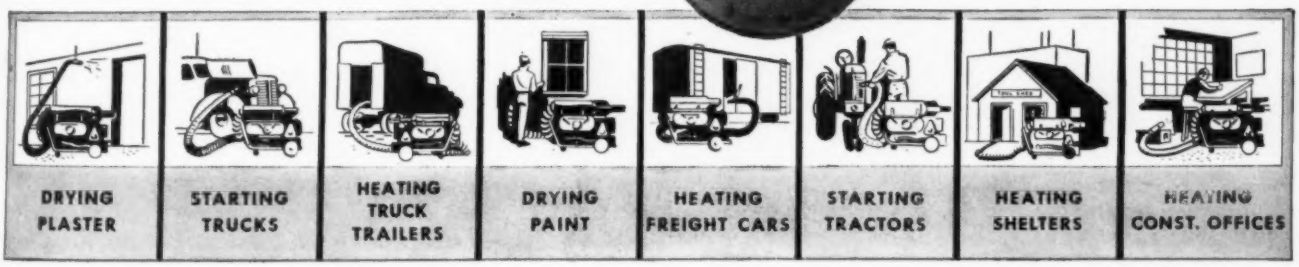
Here's cheap plentiful . . . portable . . .



5% DISCOUNT ON LOTS OF 10 OR MORE

For 1001 USES in Construction Work!

BRAND NEW ORIGINAL CRATES



Anyone in the construction business will welcome this remarkable heater for its 1001 uses. Heating shelters, sheds, barns, warehouses, storage buildings and construction offices are only a few of the endless tasks it performs. Wherever you want heat *quickly*, economically, just push this portable heater to the spot wanted, pull the starter cord (like an outboard motor) and there's a torrent of heat . . . 100,000 BTU's per hour on only 1¼ gallons of gasoline. Pays for itself many times over by preventing loss of time due to cold weather set backs. This heater was used by army and navy in the Arctic to heat plane interiors, start motors, heat huts, etc. It is made by Stewart-Warner and each heater is brand new and fully guaranteed. Because it is a surplus asset you can buy it at less than ½ price—$295 f.o.b. Minneapolis. You will have to act fast as quantity is limited. Replacement parts available.

SPECIAL DISCOUNT TO DEALERS

- 3 ducts, one is 16' long, two are 10' long
- 100,000 BTU's per hour
- Weighs 250 lbs.
- 1½ horsepower
- 1¼ gallons of gasoline per hour.

~~$600.00~~
NOW
$295.00
F. O. B. Minneapolis Minnesota

ENNIS SUPPLY COMPANY
Minneapolis 1, Minnesota, U. S. A.

MAIL THIS ORDER FORM FOR IMMEDIATE DELIVERY

ENNIS SUPPLY COMPANY Dept. WS
324 N. 1st St.
Minneapolis, Minnesota

Please ship by fast freight or express, f.o.b. Minneapolis, Minn.
Check ( ) or Money order ( ) enclosed.

Name_____

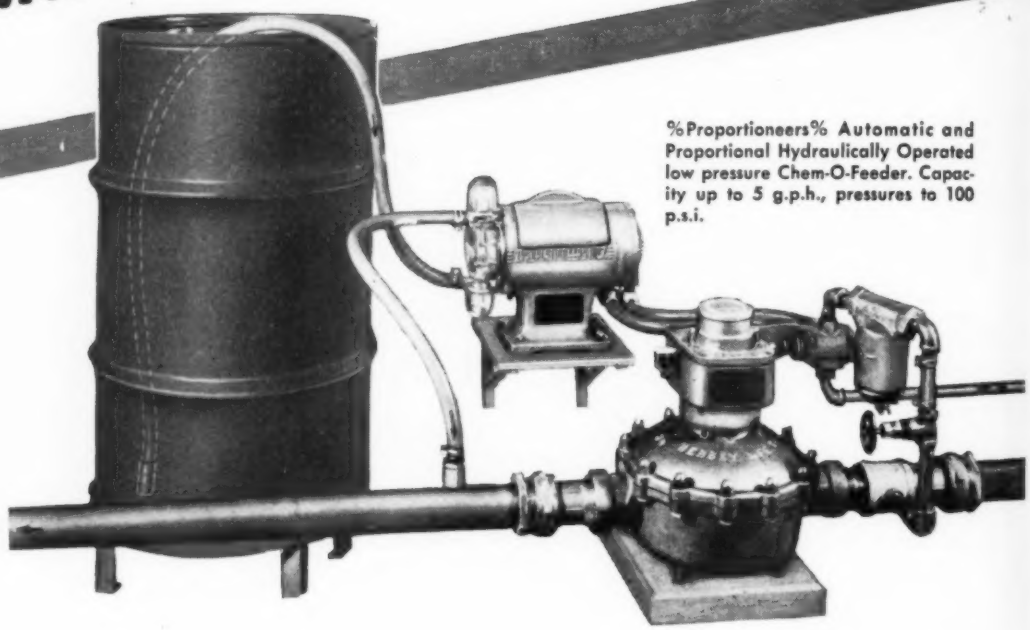
Address_____

City_____ Zone____ State_____

ON THE TRAIL OF PURE WATER

FAST OR SLOW

%PROPORTIONEERS% CHEM-O-FEEDER MAINTAINS THE PACE



%Proportioneers% Automatic and Proportional Hydraulically Operated low pressure Chem-O-Feeder. Capacity up to 5 g.p.h., pressures to 100 p.s.i.

As a hound trails Br'er Rabbit up hill and down, %Proportioneers% Automatic and Proportional Chem-O-Feeder follows a variable water supply. The Chem-O-Feeder, controlled by standard water meter, starts, varies and stops feeding of chemical as the water supply . . . pumped or gravity flow . . . comes on, fluctuates, and tapers off. Every drop of water is correctly sterilized — all guesswork is eliminated. There's no chance of dangerous undertreatment, or wasteful overtreatment with resulting disagreeable taste. Full hydraulic operation, utilizing power from the main, insures unfailing water treatment. Reagent head of "See-Thru" plastic reveals the action of the valves and the flow of the liquid fed. %Proportioneers% Chem-O-Feeder will finish your water treating problems . . . economically, dependably. Write for Bulletin SAN-1.

% PROPORTIONEERS, INC. %

9 N Codding Street, Providence 1, R. I.

This Name Stands for QUALITY

RENSSELAER

QUALITY means dependable, trouble-free service year after year! Quality means ease of operation, safety, economical maintenance.

Rensselaer, the leader in the design and manufacture of gate valves for over 60 years, has proven its superiority in thousands of installations. Write for Bulletin X.

Our expert Field Representatives are ready to bring you Rensselaer's engineering "know - how" anywhere, anytime, on short notice.

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P. O. Box 5270

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Haverhill National Bank Bldg.

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Subway Terminal Bldg.

MEMPHIS, TENN.
822 Dermon Bldg.

MINNEAPOLIS, MINN.
625 Plymouth Bldg.

OKLAHOMA CITY, OKLA.
817 Braniff Bldg.

PITTSBURGH, PA.
1404 Oliver Bldg.

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115 Townsend St.

SEATTLE, WASH.
1252 First Ave., South

WACO, TEXAS
206 Franklin Ave.

RENSSELAER VALVE CO.
TROY, N. Y.

Can this be why

"It is our belief that the great amount of the loss is accounted for in inefficient registration of the meters, because the meters that were in service for so many years, when brought into the shop and tested before repairing, gave a very inefficient registration at one gpm whereas the new meters give us excellent results at ⅛ gpm."

From an article in Water Works Engineering by Mr. Carl Duy, Engineer of Water Works, Aurora, Ill.

YOU MAY BE WASTING WATER AND LOSING REVENUE?

THIS thought from the report of a City that made and saved $21,000 in 15 months by testing, repairing and replacing old water meters, should make YOU think! It indicates the importance of bringing in old meters for testing and repairing them or installing new meters to register at low flows . . . (at least 90% at ¼ gpm is what any repaired domestic meter should register).

● *YOUR TRIDENT REPRESENTATIVE will help you install an efficient and economical program of meter testing and repair to help offset the difference between your fixed rate and rising operating costs. There will be no obligation on your part. The Trident man is a helpful man to know. Contact him!*

174

Trident WATER METERS

Tridents are simple, rugged and retain their high initial accuracy over many years of operation. After many years on the line, new interchangeable parts will fit the old casing, make them "better than when new," at small expense. Trident meters can be easily repaired to register 90% accurate at ¼ gpm, the minimum acceptable performance for domestic meters.

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WATER & SEWAGE WORKS

VOL. 94, NO. 11 NOVEMBER, 1947

A Gillette Publication

PERFORMANCE RECORD OF 14-YEAR OLD TRANSITE WATER MAIN AT WINNIPEG

Field and Laboratory Tests Compare Present Flow Capacity, Strength, and Other Physical Characteristics with Pipe Originally Laid

By W. D. HURST
City Engineer
WINNIPEG, MANITOBA

IN pursuance of a comprehensive program to obtain performance data on various types of its Transite asbestos-cement pipe, late in 1946 the Johns-Manville Company arranged with the City of Winnipeg for a series of tests to be made on the Transite Pressure Pipe which forms part of the city's water distribution system.

The proposed program consisted of two major parts; (1) field tests on pipe in actual service, and (2) removal and shipment of several sections of the pipe to the company's Research Center at Manville, New Jersey, where laboratory tests would be made. The purpose was to establish the present condition of the pipe and compare it, wherever possible, with known characteristics of the same pipe at the time it was installed.

Winnipeg was chosen for a test site by the Johns-Manville Co., because part of the Transite Pipe laid here represented one of the early installations of this material and because soil conditions in this city were recognized as being corrosive to pipe.[1]

Believing that the information to be gained would be advantageous to the people of Winnipeg, the city officials favored participation in the program and plans for the tests were soon under way.

City of Winnipeg

The City of Winnipeg is situated in the south-central section of Manitoba, Canada, and is the capital of

Photo Taken in 1932 Showing 18-in. Transite Pressure Pipe Distributed Along St. James St. Prior to Installation

the province. It is the fourth largest city in Canada, with a population of approximately 230,000. Because of its size and location, important commercial interests have been attracted and the city has become firmly entrenched as the retail, wholesale and trading center of the area. Winnipeg is also a railroad center and has important manufacturing establishments, including wood-working, clothing, farm implement, and packing plants.

Winnipeg is one of a group of municipalities in south-central Manitoba which are served by the Greater Winnipeg Water District. This agency was formed in 1912 through incorporation by the legislature, and is managed by a Commission under the jurisdiction of an administration board composed of representatives from the municipalities concerned. These municipalities include the cities of Winnipeg and St. Boniface; the municipalities of St. James, Tuxedo, Fort Garry, St. Vital, East and West Kildoran; and the town of Transcona. The aggregate population of this area is approximately 302,700.

Recording Readings During One of the Pitometer Test Runs

Corrosive Soil and Electrolysis from Sub-Station and Street Car Lines Combined to Create Unusually Severe Corrosive Conditions on St. James Street

Water Supply

Originally, Winnipeg's water supply was obtained from the Assiniboine River, and later from a system of wells. About the time of the formation of the Water District, however, plans were under consideration for the development of the present source. This is Shoal Lake, an arm of the Lake of the Woods, situated about 95 miles east of Winnipeg.

Not long after the formation of the district, this plan for the new source of supply was adopted. Preliminary work and actual construction—including the building of a 96½-mile concrete aqueduct—were completed and water turned into the system in April, 1919.

The water is ordinarily of excellent quality for both domestic and manufacturing purposes,[2] and the supply considered virtually inexhaustible. The District supplies the water in bulk to the City of Winnipeg under low pressure, from the aqueduct. Upon delivery of the water from the reservoirs, the City assumes control of its storage, treatment, pumping, and distribution, the latter functions being carried out under the direction of the City Engineer.

Distribution

The distribution system within the City of Winnipeg consists of cast iron, asbestos-cement, and reinforced concrete pipe. It aggregates approximately 321.34 miles of mains 4 inches to 36 inches in diameter. This figure includes 12.8 miles in a separate high pressure system used ex-

clusively for fire protection service in the principal mercantile and industrial areas.

There are 46,939 service connections and 2,983 fire hydrants, of which 161 are on the high pressure lines. Active services are approximately 100 per cent metered and, at latest figures, the consumption of water averaged 17,577,424 Imperial gallons per day.

Geology of Winnipeg

The soil in Winnipeg is a lacustrine and alluvial silt overlying glacial till, and is rich in carbonate of lime. It had its origin in the grinding and pulverizing of limestone rock areas lying immediately to the north, and was formed by the southward moving glaciers of the ice age.

Cutting Pipe with Pilot Cutter for Removal of Simplex Coupling Assembly

The soluble salts originally present in the limestone have crystallized and can be observed in pockets and stringers both vertical and horizontal in the clay immediately underlying the surface soil.[3] The principal salt deposits encountered in shallow excavations include the objectionable sulfates of sodium, magnesium and calcium.[4]

Soil Conditions

The soluble salts of sodium, magnesium and calcium in Winnipeg's soil are among the chief causes of its relatively high corrosiveness.[4] The action is set up on underground pipe when the ground water dissolves the salts present in the soil. The solution then acts as an electrolyte in conjunction with metallic constituents of pipe walls and fittings. The resultant corrosion is an electrochemical process induced by galvanic action, and is of the type which produces graphitic softening of cast-iron.[1] It is this form of corrosion

The Author

which causes the greatest concern in this locality.

Another major factor causing deterioration of pipe material in Winnipeg has been electrolysis. Experts who investigated this influence (1906, '09, '15) concluded that electrolysis was particularly active here.[4] It is also generally accepted that where stray electric currents act on mains already exposed to aggressive soils, corrosion may be quite rapid. Remedial measures, however, were instituted following the 1915 report and since that time true electrolysis has been very materially reduced.

Some authorities have recently suggested that corrosion of iron pipes in this soil is caused by anaerobic microbiological action such as has been described by Bunker.[5]

First Use of Transite

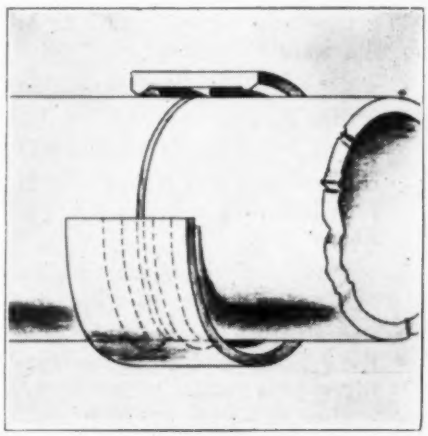
In the spring of 1932, it was considered necessary to improve the water supply and pressure in the

To Secure Undisturbed Simplex Coupling and Pipe Assembly, the Unit Was Cradled and Then Lifted From Trench by Crane

southwestern part of Winnipeg and an adjacent residential suburb. In addition to extending a new feeder line into the area concerned, completion of the work required laying a connection along St. James Street from the feeder on Portage Avenue to an existing line crossing beneath the Assiniboine River. The latter had been laid about two years previous to provide for anticipated future needs.

Selection of the pipe for the St. James Street connecting line presented something of a problem. The soil in this area was known to be particularly corrosive with conditions further aggravated by severe electrolysis attributed to the close proximity of an electric sub-station.

Many ways of coping with the situation were carefully studied and their



Cutaway Sketch of Simplex Coupling and Pipe Assembly
(*An assembly such as this was removed intact for pressure tests.*)

merits weighed one against the other. It was the non-conducting and corrosion-resisting qualities of asbestos-cement pipe which led first to its consideration and later—among other factors—to the decision favoring its use.

Approximately 752 feet of 18-inch Class C Transite Pipe were used for the connecting line on St. James Street and 431 feet of 14-inch Class C pipe for the new feeder on the other side of the river. Pipe of both sizes had a 300-foot head pressure rating.

The 18-inch line on St. James Street was selected as the most suitable subject for the forthcoming tests because it was Winnipeg's oldest installation of Transite Pipe, had operated under a combination of unusually severe soil conditions, and offered a straight, clear run of sufficient length for a satisfactory flow test.

Hydrostatic Pressure Tests—On the Left, Test of Simplex Coupling and Pipe Assembly—On the Right, Test of 13 ft. Section of Pipe

Arrangements for Tests

The tests and other operations in the field were to include:

1. Establishing the flow coefficient of the pipe.
2. Removal and visual examination of an undisturbed assembly of pipe including a Simplex Coupling.
3. Removal and visual examination of several sections of pipe.
4. Securing an unused length of the original pipe from the Winnipeg pipe yard.
5. Securing water and soil samples for analysis.
6. Crating and shipping all test specimens to the Johns-Manville Research Center at Manville, N. J.

The laboratory tests and analyses were to include:

1. Hydrostatic pressure tests on the Simplex Coupling and pipe assembly, and on individual lengths of pipe.
2. ASTM 3-edge crushing test on specimen piece.
3. Corporation stop pull-out test.
4. Chemical analyses of water and soil samples.

Arrangements for the tests went forward rapidly. The City of Winnipeg arranged for the necessary pipe to be uncovered and several sections removed. Two Johns-Manville staff engineers were assigned to assist in the test and carry out other field work. City Engineer W. D. Hurst, Waterworks Engineer, N. S. Bubbis, and City Alderman J. Blumberg volunteered to act as official observers.

The field work at Winnipeg was done during the last few days of November, 1946. The laboratory tests at Manville, New Jersey, were made early in 1947.

Establishing the Flow Coefficient

The Pitometer Company, Inc., of New York was the firm selected to establish the flow coefficient and assign a qualified engineer with suitable equipment to conduct the flow tests.

To obtain the flow test data, it was necessary to establish two gauging points separated from each other by a known distance within a reasonably straight run of pipe.

Examination of available maps showed that the St. James Street connecting line provided a test run of 580.3 feet between gauging points as measured by engineers of the Winnipeg Water Works Department. This entire run was free of branch connections and valve fittings. The upstream gauging point was located 25 feet south of an 18-inch gate valve on the line. A standard 1-inch Mueller corporation stop was inserted at this point, and a similar stop at the downstream point.

Prior to selecting the final location of the Pitometer rod used to measure velocity head, simultaneous readings at the gauging points showed that the velocity was uniform and steady throughout the entire length of the run. It was then decided to place the Pitometer rod and the equipment for measuring the friction head loss at the downstream gauging point during the test runs.

The line under test feeds an area in which the demand for water is low, and, in order to induce the desired velocity for each test run, it was necessary to close the valves on three other feed lines and open fire hydrants downstream from the test section. In this way, velocities ranging from 1.1 to 1.9 feet per second were obtained. During each test, the velocity was held constant and readings on the manometer recorded at 30-second intervals.

The friction head loss was determined from readings on a second differential manometer connected to the upstream and downstream corporation stops. Low temperatures required precautionary measures against freezing in the connecting line, so a 2½-inch fire hose was used. This hose was fitted with a by-pass to provide sufficient flow, between test runs, to prevent the formation of ice.

The test data were recorded for computation by the Pitometer Company upon the engineer's return to New York. The results are best stated by Mr. E. Shaw Cole, Chief Engineer of the Pitometer Company, whose official report concludes, in part, as follows:

> "The coefficient of friction 'C' in the Williams-Hazen formula varied from 143 to 132 for eleven different test runs, and had an average value of 139.6, or, for all practical purposes, 140.
>
> "The high value of 'C' = 140, which we believe is a reliable index of the present capacity of the pipe tested, shows that there has been little if any loss in capacity since 1932 when the pipe was laid."

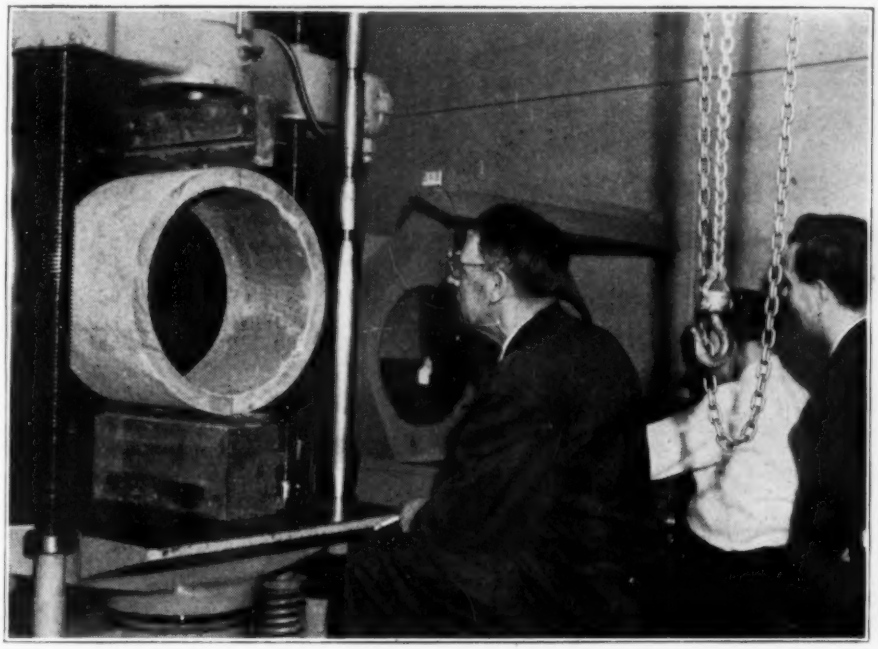
Pipe Removal

Upon completion of the Pitometer flow measurements, the pipe line was shut off, and de-watered, and several sections fully uncovered so that they

could be removed from the ground for immediate visual examination and for shipment to the Johns-Manville Research Center for complete laboratory tests. Representative water and soil samples were also collected for analysis.

Two adjacent lengths of pipe were carefully braced in the trench and then cut into 3 equal parts approximately 9 feet long. A typical assembly of pipe, including a Simplex Coupling, was thus left undisturbed for laboratory test purposes. The coupled assembly was cradled in a rigid wooden framework, removed from the trench by crane and crated for shipment. The remaining two 9-foot sections and one standard 13-foot section were removed from the trench and also readied for shipment.

The interior surface of the pipe was smooth, hard, and apparently unchanged from its original state. The exterior of the pipe showed the same degree of resistance to scratching and penetration as the original pipe material. Thus, close visual examination of the pipe at the time of its removal from the ground indicated it to be unchanged in hardness and appearance.



A.S.T.M. Three-edge Crushing Test Being Made in Emery-Southwark Testing Machine

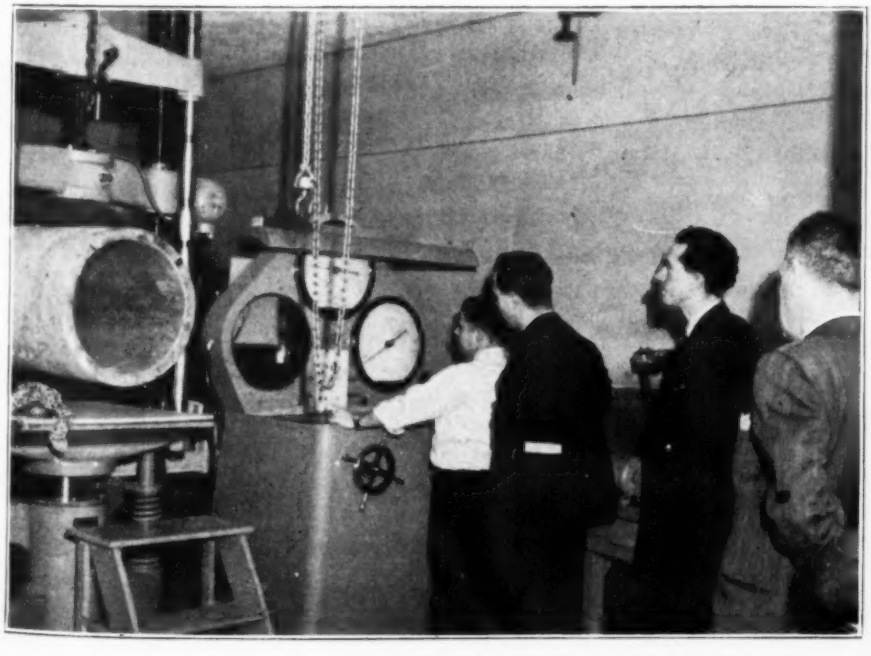
Pressure Tests

Transite Class C pipe, as manufactured by the Johns-Manville Co. in 1932, was designed to withstand a hydrostatic test pressure equivalent to double the maximum recommended working pressure. It was decided therefore to determine whether it would withstand the pressure to which it was originally tested at the factory.

The Simplex Coupling assembly, removed from the field with sleeve and rubber rings intact (see accompanying sketch) and representative of the assembled pipe as found in the line, was the first unit to be tested. It was placed in the hydrostatic testing machine, the water turned on, and the pressure raised to 260 pounds per square inch—equal to the original factory test pressure and representing 4 times the normal working pressure of the line from which it had been removed. This pressure was held for several minutes while observers closely examined the coupling for signs of leakage. None was observed.

This completed the test on the Simplex Coupling assembly. It was not tested to failure because it was to be shown by the Johns-Manville Co. at the joint AWWA & FSWA Convention at San Francisco in July.

Additional hydrostatic pressure tests were made on individual pipe sections. A 9-foot length was also tested at 260 pounds, and reserved for other types of tests. The two standard 13-foot lengths were tested to 260 pounds, and then to failure. The exposed pipe failed at 325 pounds and the other at 430 pounds per square inch. These values, falling well within the accepted range of individual pipe strengths attained for that date of manufacture, represent 65 and 170 pounds, respectively, in excess of the factory pressure to which they were originally tested.*



Pull-out Test on ¾-in. Corporation Stop Inserted in Short Section of Pipe

Crushing Test

A piece 12 inches long was cut from one of the shorter exposed sections to serve as a specimen for determining the crushing strength of the pipe.

This piece was placed in an Emery-Southwark testing machine, and sub-

*Today, in order to provide for the unknown future trench and service conditions sometimes encountered in industrial and municipal water supply systems, Transite Pressure Pipe is shop-tested by the manufacturer to four times recommended working pressure. This factor of safety is the same as that commonly required in iron-body gate valves for water systems.

Effects of ¾-in. Corporation Stop Pull-out Test
(*Note: Threads did not strip; failure occurred by actual pull-out of pipe wall.*)

jected to the standard ASTM 3-edge bearing test. It sustained a maximum load of 10,260 pounds before failing. This strength compares favorably with the crushing strength of new Transite Pressure Pipe as reported by the Underwriters Laboratories, Inc. in 1937.

Corporation Stop Pull-out Test

A ¾ inch Mueller Cem-Res combination drill and tap was used to drill and tap a hole in a 30-inch section of the used pipe, and a standard ¾ inch Mueller corporation stop was inserted.

The pipe was placed in the testing machine and pull-out force applied to the stop. The pipe resisted a force of 4,610 pounds before breaking outward and freeing the stop.

Examination of the specimen showed that the pull-out was normal —the threads in the pipe did not strip and failure occurred by the actual pulling out of the pipe wall material itself.

Water and Soil Sample Analyses

Water

The laboratory analysis of the water sample taken from the line is as follows:

pH	7.45
Color	None
Odor	None
Alkalinity as bicarbonate calculated to $CaCO_3$	103 ppm.
Total hardness expressed as $CaCO_3$	68 ppm.
Suspended solids	Trace
Dissolved solids	98 ppm.
Loss on ignition at 800°F. (includes organic matter)	29 ppm.
Fixed soluble solids	69 ppm.

Analysis of Fixed Solids

Silica, SiO_2	9.0 ppm.
Iron and aluminum oxides	1.0 ppm.
Calcium oxide, CaO	26.0 ppm.
Magnesium oxide, MgO	8.0 ppm.
Sulphates as SO_3	Trace
Chlorides as chlorine	Trace

A comparison with earlier analyses shows that the general character of the water has not changed materially over the years and has little corrosivity.

Soil

The following is the laboratory analysis of the soil sample taken adjacent to the pipe:

	220°F. Oven Dry Basis
Loss on ignition at 1800°F.	9.56%
Silica, SiO_2	54.97
Total iron as ferric oxide, Fe_2O_3	7.22
Aluminum oxide, Al_2O_3	18.97
Calcium oxide, CaO	3.58
Magnesium oxide, MgO	3.72
Alkalies and undetermined matter—by difference	1.98
	100.00%
Carbon dioxide from carbonates	2.91%
pH of soil (when mixed with equal volume of distilled water)	8.25

Microscopical examination: The soil contained a large amount of amorphous particles and a small amount of crystalline material.

Examination of Simplex Coupling Rubber Rings

The Simplex Coupling used to assemble Transite Pressure Pipe consists of an asbestos-cement sleeve and two rubber rings. During assembly, the sleeve is pulled over the rings, compressing the round shape into an oval to form a tight seal between the wall of the pipe and the coupling sleeve.

When the full-length sections of pipe were removed from the line at Winnipeg, the rubber rings used in the Simplex Couplings were reserved for laboratory examination. Careful inspection of these 14 year old rings showed them to be free from any signs of deterioration. Ring surfaces were smooth and free from pits or cracks. The liveliness and recovery of these rings, upon stretching and twisting, was found to be equivalent to that of new ones.

The soundness of the rings was fully substantiated by the results of the pressure test on the Simplex Coupling and pipe assembly described under the heading "Pressure Tests." In this test the rings were tested in the undisturbed position in which they had been installed 14 years before. The pressure was raised to 260 pounds, or four times the head in the Winnipeg line. Held at this pressure, the rings were carefully examined. Both rings held tightly and no leakage occurred.

Conclusion

As stated in the introduction to this report, the objective of this series of investigations was to establish the present condition and physical characteristics of this 14 year old line, and, by determining how it is performing functionally and structurally today, provide a basis for comparison with its original condition. It was felt that the field conditions under which this pipe has operated and the 14 year period in which it has been in service, would permit arriving at a conclusion regarding its long-term performance expectancy. In view of the fact that no deterioration in either the carrying capacity or physical characteristics of the pipe has been noted, it is not possible at this time to fix a future service life-expectancy for this pipe. On the basis of the performance rendered to date, however, it is reasonable to anticipate a life-expectancy of many times that already obtained.

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2. *Journal—American Water Works Assn.*, Vol. 37, No. 11, Nov., 1945.
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4. *Journal—American Water Works Assn.*, Vol. 37, No. 10, Oct., 1945.
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N.E.W.W.A. HOLDS 66th ANNUAL MEETING

With Seventy-Odd New Members During Year Total Membership Passes Nine Hundred Mark for First Time

OPENING with the customary Business Meeting, the New England Water Works Association held its 66th Annual Meeting

Presidents

(Incoming)
Don Calderwood
Supt. Pennichuck Water Wks. Co.
Nashua, N. H.

(Retiring)
Arthur L. Shaw
Partner
Metcalf & Eddy
Boston, Mass.

in Boston, Mass., Sept. 16-19, attended by almost 700 members and guests.

Secretary Knox reported that the membership total had gone to an all-time high of 900 during the year as the result of a new member campaign that had brought in seventy-odd new members since the 1946 meeting.

The Finance Committee (T. R. Camp, Chairman) presented a budget for the ensuing year which calls for expenditures up to $13,200 with anticipated revenue of only $12,850, and recommended that the deficit be taken from the Association's surplus of $26,243 rather than increase the $6.00 annual membership dues at this time.

Officers Elected

The following officers were announced as elected by letter ballot:

President—Donald C. Calderwood
Supt. and Engineer
Pennichuck Water Works
Nashua, N. H.

1st Vice-Pres.—Arthur C. King*
Supt., Water Dept.
Taunton, Mass.

2nd Vice-Pres.—Sidney S. Anthony
Supt., Water District
Augusta, Me.

Treasurer—Wm. P. Melley
Supt., Water Dept.
Milton, Mass.

Director—Thos. R. Camp
Camp, Dresser & McKee Engrs.
Boston, Mass.

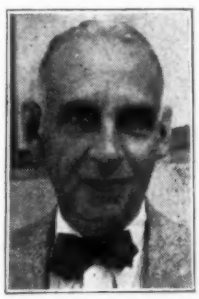
*Mr. King, elected Vice-Pres. in 1946 for two year term, automatically becomes 1st Vice-Pres.; and the holdover Directors are Joseph C. Knox of Boston and Phil J. Holton, Jr., of Providence, R. I.

The Dexter Brackett Award

The Dexter Brackett Memorial Medal was presented to Frederick O. A. Almquist, Principal Asst. Engr. of the Conn. State Dept. of Health, for his paper, "Problems in the Disposal of Sludge and Dirty Wash Water from Connecticut Filtration Plants." Mr. Almquist's paper was published in the Dec., 1946, issue of the NEWWA Journal, and according to the report of the Committee on Awards (E. Sherman Chase, Chairman) represents the best paper yet published on the disposal of sludge and wash water from filtration plants.

Entertainment and Exhibits

The entertainment this year seemed especially worthy, Reg.



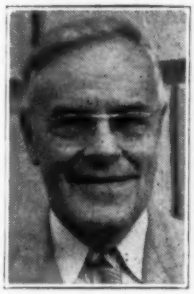
Secy.
Joseph C. Knox
Sr. San. Engr.
Mass. Dept. Health
Boston

Treas.
Wm. P. Melley
Supt.
Water Dept.
Milton, Mass.

Hayes, Chairman of the Committee on Entertainment, taking the bow.

On the evening preceding the opening of the meeting there was a "get-together" staged for early arrivals. The first evening of the meeting was given over to band music and a first rate show comprised of specialty acts and the indispensable act of magic. The second evening was devoted to dancing, while the third evening featured the Annual Dinner preceded by the Cocktail Hour and followed by dancing. Special features for the ladies included a tea and social hour the first afternoon and a bridge party on the second afternoon. For the men a golf tournament was held, with Reg. Kranmer at 75 the low gross winner and J. F. Jenks, Jim Turner, Hugo Bergman and Hank Draper winners in the Kickers' Handicap.

In the Exhibit Hall forty-six member firms of the Water and Sewage



Vice Presidents

(Senior)
Arthur C. King
Supt.
Water Dept.
Taunton, Mass.

(Junior)
Sidney S. Anthony
Supt.
Water District
Augusta, Me.

Works Mfrs. Assn. were represented by displays and demonstrations which were well attended by members and guests.

PAPERS AND DISCUSSION

"Dynamics of Water Chlorination," by Gordon M. Fair, Dean, Graduate School of Engineering, Harvard University, Cambridge.

Prof. Fair's paper, presented by his associate, **Dr. S. L. Chang, Asst.** Prof. of Sanitary Biology, constituted a progress report on the effectiveness of various forms of available chlorine in destroying various types of organisms and viruses. The studies under way at Harvard are directed toward a determination of basic factors in the effective chlorination of water and the possibility of developing a formula which will reveal the correct concentration of residual available chlorine depending upon the nature of the residual, temperature, contact period and nature of organisms to be destroyed.

So far these studies have revealed amongst other things the following:

In the destruction of E. Coli hypochlorites are only 2.5 per cent as effective as hypochlorous acid, thus indicating the high importance of acidity or alkalinity of the medium and the slowdown of chlorination at pH values above 8.5.

In the destruction of viruses, such as the Polio and Jaundice virus, the time of contact becomes of little importance, whereas the concentration of free residual chlorine and pH

value is all important, and the minimum of residual chlorine as hypochlorous acid is 0.6 ppm. to secure positive kill. Lower amounts do not insure a kill regardless of contact period.

To the contrary, the Amoeba organism is destroyed most effectively with long chlorine contact, but again hypochlorous acid (free available chlorine) is the most effective form of residual, since chloramine at pH 7 is only 60 per cent as effective as a like residual in the form of hypochlorous acid or "free residual."

Concerning the destruction of spores, it appears that time of contact is more important than the form of residual and its concentration—i.e., amount of residual. Likewise in the destruction of cysts the contact period is all important and in this instance at pH values above pH 8.5 the chloramines are more effective than the hypochlorites on long contact.

From the results of the Harvard studies to date it would appear that great importance resides in the nature of the residual chlorine in the great majority of instances and the comparative effectiveness of *free* residual is emphasized as is also the contact period when spore, cyst and amoeba destruction is to be insured.

"Contamination of Water Supplies by Radio-active Substances," by Dr. J. Carrell Morris, Prof. of Sanitary Chemistry, Harvard University.

Dr. Morris said that water supplies could be contaminated with dangerous radio-active products in cooling water from atomic power piles discharged to a water supply stream. And, of course, by an atomic bomb exploding at or beneath water surface. He described the alpha, beta and the most penetrating gamma rays. The greatest danger of radio-active substances is found in the super-anemia resulting. Mr. Morris did not believe that the sabotage of water supplies with radio-active substances would prove practicable. He then noted that coagulation of radio-active water with iron salts would remove the radio activity. Also zeolites remove radio activity.

"Watershed Practices of the Bridgeport Hydraulic Co.," by Fred. K. Silliman, Civil Engr., Bridgeport Hydraulic Co., Bridgeport, Conn.

After reviewing the reforestation program, the history of the Christmas tree and orchard industry of the Bridgeport Hydraulic Co., Mr. Silliman told of the activities of the company in maintaining a sanitary watershed and good public relations with residents on the watershed by a full time sanitary engineer employed since 1942 to insure proper sewage disposal facilities and their care and maintenance. It appears

Medalist
F. O. A. Almquist
Prin. San. Engr.
Conn. Dept. Hlth.
Hartford, Conn.
(Winner of the Dexter Brackett Medal)

that the water company frequently pays the cost of such facilities and supervises their installation. The minimum size of septic tank permitted is 500 gals. feeding leaching trenches.

One of the most effective and useful projects had been the complete aerial mapping of the entire watershed, such mapping having revealed

Committee Chairmen

E. Sherman Chase
Cons. Engr.
Boston
(Awards)

Thos. R. Camp
Cons. Engr.
Boston
(Finance)

4 square miles of area in the shed not known to exist and also 25 homes. Mr. Silliman exhibited the complete map on scale of 1 inch = 1200 feet, which had shown many errors on the topographical maps of the Government.

Mr. Silliman told of studies made to determine the sources of the most highly colored waters entering the reservoirs and recent experiments involving alum coagulation of such feeder waters for color removal in the reservoirs.

Ranney Water Collectors

A. Leland Glidden, Vice-President of Ranney Water Collectors Corp. of New York City, described two installations of **Ranney Water Collectors in Connecticut,** one at Wallingford and the other at Rocky Hill, both being for industrial supplies. The first had the collectors driven out under the Connecticut River to procure induced natural filtration from the river and abundant supply. The Rocky Hill collector is a two tier collector. Pointing to other collectors making use of river or lake infiltration, he cited the seven units of the Indiana Ordnance Works on the Ohio and the unit at Manitowoc, Wis., with collectors driven out under Lake Michigan. Another installation, that of the Du Pont Co. at Penn's Grove, N. J., was put in to avoid drawing from an iron bearing strata tapped by ordinary wells.

Mr. Glidden cited the value of induced natural filtration for securing a ground water of high purity and uniformly low temperature. In reply to questions, he said that the caisson for shallow units is 11 ft. or 13 ft. in diameter and 20 ft. for the deeper units. The number of laterals driven horizontally vary from 8 to 14. The laterals are 8 in. diameter made of "Toncan" metal. The wall thickness of the stout laterals is ⅜ to ½ in. to stand up against horizontal driving with 150 ton jacks.

The cost per Ranney unit averages about $10,000 per mg. of water developed or between $30,000 and $150,000 per unit, and Mr. Glidden pointed to the all important survey work incidental to the construction of such an expensive unit.

"Ground Water Supply Development," by Alan W. Ross, Vice-Pres. of the Layne-New York Co., N. Y. City.

Mr. Ross in stressing the importance of ground water cited the fact that 6,500 of the 10,000 odd public water supplies in U. S. are obtained from wells, the largest development being 100 mgd. on Long Island with Houston, Texas, second and Memphis, Tenn., probably third with 40 mgd. He noted the advantages of well supplies as being purity, palatability, coolness and stability. He also cited the licking of the sand cloggage problem with the gravel packed well, improved screen design and more efficient turbine type well pumps.

After his brief talk Mr. Ross presented an outstandingly fine color film picturing the modern methods employed by Layne Companies in locating, drilling, casing and developing deep wells, and the laboratory control of the entire operation.

The Eric Process of Water Main Rehabilitation

Alfred B. Anderson, Chief Engineer of the Pittsburgh Pipe Cleaner Co., in discussing the **"Economics of Rehabilitation of 3 to 24 Inch Water Mains,"** pointed out that the cost of main rehabilitation by cleansing and lining in place can be carried as an asset in the bookkeeping of the utility. He then described somewhat in detail the Eric Process of cleaning the main down to bare metal and then applying a coating of bituminous by electrolytically depositing a film of asphalt from an aqueous emulsion of this material. The main is filled with the conducting emulsion and the interior electrode consists of an element which is at the center of the pipe and drawn through the emulsion at rates between 2 and 6 ft. per minute. The center electrode is the cathode and the pipe becomes the anode. The current applied is of high amperage and low voltage, this combination being productive of a thin dense coating which acts as an insulator, thus automatically regulating the thickness of protective film and revealing when the cathode should be moved forward in the plating process. In this process, wherein over 2,000 miles of mains have been rejuvenated, it is imperative to remove all old coating and tuberculation down to the bare metal.

In answering questions, Mr. Anderson stated that the coating had stood up for at least 10 years, which is the age of the Eric Process. After reconditioning Phila. Suburban Water Co. mains the "C" value of the rejuvenated mains was found to be 128. The cost for 4, 6 or 8 in. mains is something under $1 per foot, this being the total cost. As to corporation cocks it is unnecessary to remove them. The service shutoff cocks are merely closed to prevent the asphaltic emulsion from entering. However, if it does enter the service it is readily flushed out after the main is returned to service. Interestingly, the bitumen (asphalt) will not adhere to brass or bronze.

Programmers

Alfred B. Anderson
Chief Engr.
Pittsburgh Pipe Cleaner Co.
Pittsburgh, Pa.

Alan W. Ross
Vice-Pres.
Layne-New York Co.
New York, N. Y.

"Power Development at Quabbin Reservoir," by C. J. Ginder, Sr. Engr., Metropolitan District Commission, Boston.

Mr. Ginder stated that the water yield from Quabbin Reservoir (195 mgd. safe yield) was alone sufficient for the entire Metropolitan District, and for a number of years to come power generation at Quabbin as a profitable byproduct could be anticipated. The current is sold at 6¼ mills per k.w. to the New England Power Assn. To date there have been three power installations with a fourth now being planned. He described the third development now nearing completion as one which was to boast at least 88.4 per cent water to wire efficiency and employing a 915 H.P. S. Morgan Smith Water Wheel operating under a 100 ft. head driving an Electric Machinery Co. generator. The equipment cost was $54,000 and the total cost for the complete unit was $115,000. With anticipated income at $42,000 per year until 1958, the plant will have been paid for in five years.

The entire Quabbin Project had cost $3,000,000 to produce a supply of 195 mgd. safe yield. While the power generation is incidental, the profit is of interest in its application to carrying charges.

"A Study of Ground Water Conditions in Rhode Island," by R. M. Jeffards and W. B. Allen, Providence Office of the U. S. Geological Survey.

The authors presented a theory concerning ground water flow and offered an equation for determination of probable well draw in advance of well construction. Use of this equation was advocated in planning location of wells and degree of well separation.

Paul Howard, Consulting Engr. of Boston, who has had considerable experience with actual well pumping records vs. formulas of the U. S. Govt. Survey designed to give advance information on well behavior and expected yields, stated that the records and formulas had not checked very well. Possibly the heterogeneous beds of New England had been the cause of the discrepancies. He, however, had found the seismographic work of the Geol. Survey to be highly useful in locating the rich yield glacial valleys and their boundaries.

Programmers

A. L. Glidden
Vice-Pres.
Ranney Water Collectors Corp.
New York

C. J. Ginder
Senior Engr.
Metro. Distr. Commission
Boston

K. W. Robie
Chief Engr.
Water & Sewage Dept.
Brookline, Mass.

S. L. Chang
Asst. Prof.
San. Eng.
Harvard Univ.
Cambridge, Mass.

Geo. N. Watson
Supt.
Water Dept.
Braintree, Mass.

Roy N. Aston
Tech. Dept.
Mathieson Alkali
Niagara Falls, N. Y.

Edw. L. Tracy
Chief Engr.
Vt. Dept. Health
Burlington, Vt.

"Flood Control Structures," by John E. Allen, Chief of Engineering, and C. H. Lovejoy, Chief of Operations, New England Div., Corps of Engineers, U. S. Army.

Mr. Allen explained the process of planning flood control structures and their location. Such structures are designed to cope with floods 30 per cent greater than the highest existing record. He briefly described the five flood control dams of New England, the largest being that at Franklin Falls, N. H., constructed at a cost of $8,000,000. As to reservoirs, he stated that on branches such are far less effective

John F. Kelley, Supt.
Waterbury, Conn.

Thos. E. Kennedy, Supt.
Fitchburg, Mass.

Frank J. Thiery, Supt.
Bristol, Conn.

Arthur Faneuf, Supt.
Concord, Mass.

Lester Hull, Supt.
Gloucester, Mass.

Herb Crowell
Rensselaer Valve
Haverhill, Mass.

M. M. Gibbons, Supt.
Rahway, N. J.

Jimmy Williamson
Mueller Co., N.Y.C.

Sherman Rogers
Supt. Distribution
Hartford, Conn.

than on main streams. He stressed the fact that flood control reservoirs were of no use as power producers since these reservoirs should be empty at all times if they are to serve their primary function, the catching of flash run-off.

Mr. Lovejoy described modern methods of constructing earth flood control and reservoir dams with heavy and fleet machinery, including the speedy 15 yard rubber tired trucks, the invaluable sheep's-foot rollers, bulldozers and the like.

In reply to questions, it was revealed that flood control dams are paid for and operated by the U. S. Govt. Local dykes are paid for and maintained by the community protected, Hartford, Conn., being a notable example.

"Rutland's Water Supply Emergency," by Edward L. Tracy, Director, Div. of Engineering, Vermont State Dept. of Health, Burlington, Vt.

Mr. Tracy described the water supply emergency in Rutland caused by flood-waters and a dam failure on June 3, 1947, which sent down a 15 ft. wall of water on Rutland, putting its gas, electric and water utilities out of commission. Rutland without water storage in the city depended upon a 5 mg. reservoir 12 miles distant. The deluge scoured out 600 ft. of 16 in. and 900 ft. of 12 in. supply main. Result—the city completely out of water and the necessity of establishing 10 pumping points to supply the community with chlorinated emergency water until the main replacement was completed 13 days later. Fortunately there was not a case of water borne disease reported as the result of the disaster.

Chlorinators and hypochlorites were rushed in, O.C.D. pumpers were employed and steel barrels used as hypochlorite feeders. Wallace & Tiernan Co. and Proportioneers, Inc., supply chlorinating equipment and services. The U. S. Army Engrs. flew in mobile purifying plants and personnel from Ft. Baldwin, Va., and the U. S. Public Health Service supplied personnel. Within a short time water with 1 to 2 ppm. residual chlorine was available all over the city, but main leakage made pressure maintenance difficult. To clear the repaired supply main the Natl. Water Main Cleaning Co. was called upon and on June 16 (13 days after the supply failure) normal service was established.

Mr. Tracy stated that the lesson learned from the Rutland catastrophe was that distant storage without distribution storage constitutes a vulnerable supply system. Distribution system leakage is costly in an emergency. An auxiliary source of water supply should be planned before an emergency strikes. Rutland has learned the hard way and is at present providing needed improvements to its water supply facilities.

Chlorine Dioxide as a Bacteriacide in Water Treatment

"Chlorine Dioxide as a Bacteriacide in Water Works Operation," by John F. Synan and G. P. Vincent, Technical Director, Mathieson Alkali Works, New York, N. Y.

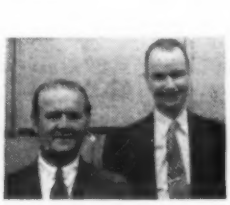
This paper was presented by **R. N. Aston,** Technical Representative of the Mathieson Alkali Works, who referred to the studies conducted at the Univ. of Michigan, which revealed all types of *free* residual chlorine to be about equally effective in destruction of bacteria, including that from chlorine dioxide (ClO_2). He also referred to observations by McCarthy of the Mass. Dept. of Health and experiences at Chicopee, Mass., with chlorine dioxide at the local filtration plant. Bacterial tests on distribution samples revealed the efficiency of chlorine dioxide residuals which persist throughout the system and hold in check the 20 degree organisms as well as the 37 degree counts. Mr. Aston gave full credit to the switch to pre-chlorination at Chicopee, which the use of chlorine dioxide had made possible. Mr. Aston also stressed the point that Chlorine Dioxide residuals were more effective in waters of high pH values than residuals from chlorination alone.

J. A. McCarthy, Chief of Labs., Mass. State Dept. of Health, confirmed the observation that 20 degree organisms had been held in check out in the mains by chlorine dioxide treatment. He also said that the treatment would remove iron and manganese effectively but the cost was against its use as an oxidant for manganese and iron.

M. M. Gibbons, Supt. of Rahway, N. J., said that he had been a user of chlorine dioxide for better than two years but preferred its application at the prechlorination point since its past application appeared to precipitate manganese and increased the color of the filtered water.

Bill Wickwire
Gen. Mgr.
and
Harold Morgan
Edson Corp.
Boston

Robt. Moir
Sr. Civil Engr.
and
Edmund Brown
Jr. Civil Engr.
Metro. Water Distr.
Boston



Harold I. Robinson
Vice-Pres.
and
Cliff W. Bauer
Sales Engr.
Pittsbg. Pipe Cleaner Co.
Boston

Walter F. Garland, Supt.
Dracut, Mass.
and
Mayo Carrington
State Dept. Health
Boston

A. J. Ovellette
Chairman
and
Angus MacKenzie
Member
Water Board
Chicopee, Mass.

Roger Oakman
Supt.
Needham, Mass.

Jas. V. Turner
Supt.
E. Providence, R. I.

Leland G. Carlton
Supt.
Springfield, Mass.

Allan F. McAlary
Supt.
Rockland, Me.

Wm. R. Clary
Mass. Dept. Hlth.
Boston

Robt. E. Fergusson
Mfrs. Agent
Boston, Mass.

Ed. Thwaits
Preload Corp.
New York

SUPERINTENDENTS' SESSION

As is customary, the N.E.W.W.A. meeting closed with a Superintendents' Session.

"Selling Your Water Works," by Geo. N. Watson, Supt. of Water, Braintree, Mass.

Mr. Watson, finding the Braintree Water Dept. in financial straights, decided to put on a publicity program for hydrant rental and fortunately got the local fire chief behind him. Result—a hydrant rental of $25 per hydrant, netting $12,875 income, which has been used to put through an improvement program to cost $195,000, and this is just a good start on what is really needed to strengthen the Braintree system.

In the questions and discussion which followed it was agreed that $25 per year is not enough but better than no rental at all. Interestingly, it developed that the Fire Chief who had supported Mr. Watson in his fight for hydrant rent, found that this payment had to be put in the budget of the Fire Dept.

Harry U. Fuller, Chief Engr., Portland, Me., Water District, said that the difficulty of the Mass. superintendents would be over in such matters as proper income for fire protection if as in Maine the publicly owned water systems should be placed under the State Public Service Commission. This regulatory body would soon straighten out the financing of water departments and see that they were managed and run more like a private utility as is the case in Maine and in Wisconsin.

Theodore Bristol, President, Ansonia, Conn., Water Co., said that hydrant rental is wrong in principle and payment for fire protection should be based on the investment in mains. This means an inch-mile charge for fire protection and little or nothing for the hydrant proper. In Ansonia, Conn., the payment per hydrant is only $10 with the balance coming as "main rental" rather than hydrant rental.

Entertainment
Reg. F. Hayes
Sales Mgr.
Hyd. Devel. Corp.
New York

Exhibits
Arthur J. Clark
Manager
Mfgrs. Assn.
New York

"Distribution System Problems," by Kenneth W. Robie, Engr. and Supt., Water and Sewerage, Brookline, Mass.

Mr. Robie described the method at present used in Brookline wherein the water main and sewer are laid in the same trench. For instance, a 10 in. sewer is enclosed in a concrete structure 3 ft. each way, thus making a leak, root and settle proof sewer. The water main is laid on top of the concrete sewer. The water department is charged one-third the cost of the trench and the sewer department pays two-thirds. The policy of the city is now to install services from all new mains and sewers up to the property line of vacant lots, thus avoiding street cutting at a later time. Service lines on old streets are laid on a shelf in the sewer and drain trench. Over the trench a concrete slab 5½ ft. wide and 10 in. thick is laid.

Mr. Robie told of some experimentation with lead substitutes in cast iron pipe jointing in comparison with lead joints. Severe double deflection and return to normal position was included in the tests on joint compounds "A" and "B" compared with joints made with lead and subjected to the same treatment. Even after these rigorous tests, joint leakage recorded was at the rate of only 8 gals./inch-mile for one compound and but 5 gals./inch-mile for the other. Mr. Robie felt that such drastic tests and their outcome was proof enough that compound joints when properly made are the equal of lead joints in withstanding any deflection of pipe normally expected.

The meeting closed with a brief address by the retiring president, Arthur L. Shaw, and a few words from the new president, Don Calderwood, who reminded members that "the more one puts into the Association the more he gets out of it in return."

Richard Smith
N. E. Rep.
and
Geo. H. Gleeson
Sales Mgr.
Water Meter Div.
Rockwell Mfg. Co.
Pittsburgh, Pa.

Joseph Moore
Supt. of Water
Burlington, Vt.
and
Walter C. Conroy
Supt. of Water
Belmont, Mass.

W. A. Adams
Mech. Supervisor
J. A. Sweeney
Asst. Supt.
C. E. Ferry
Engineer
Water Dept.
Manchester, N. H.

Thos. S. Laurence
Supt. of Water
Groton, Mass.
and
Wayne F. Damon
Supt. of Water
Leominster, Mass.

Roger G. Oakman
Supt. of Water
Needham, Mass.
and
Arthur G. Faneuf
Supt. of Water
Concord, N. H.

MATHEMATICAL CALCULATION OF PHENOL VALUE OF AN ACTIVATED CARBON

Solving the Freundlich Equation by the Method of Least Squares

by R. A. HOOT
Superintendent
SEWAGE TREATMENT WORKS
FT. WAYNE, IND.

ACTIVATED carbon for taste and odor control has long since become a prominent treatment in many water purification plants. Consequently in those respective treatment works the evaluation of the carbon has a place of some merit in the analytical routine.

The evaluation of activated carbon is based to a certain extent upon its phenol adsorption power and the determination of the phenol adsorption power in turn is based upon the Freundlich equation.

The Author

The usual method of calculating the phenol value, once the analytical work is completed, is graphically using logarithmic paper. The calculation, however, can also be made mathematically by the method of least squares.

Here is the mathematical calculation of the phenol value of an activated carbon using data, of some years ago, from the laboratory of the Fort Wayne Filtration & Softening Plant. Before proceeding with the calculation it is necessary to understand some of the terms and equations used, as explained below.

Freundlich Equation

The Freundlich equation is

$$\frac{X}{M} = KC^{\frac{1}{n}}$$

in which **X** = Phenol adsorbed in ppm.; **M** = Carbon applied in ppm.; **C** = Per cent of Phenol remaining; **K** and **n** are constants and **1/n** is the slope of the adsorption curve when plotted on Log-Log paper.

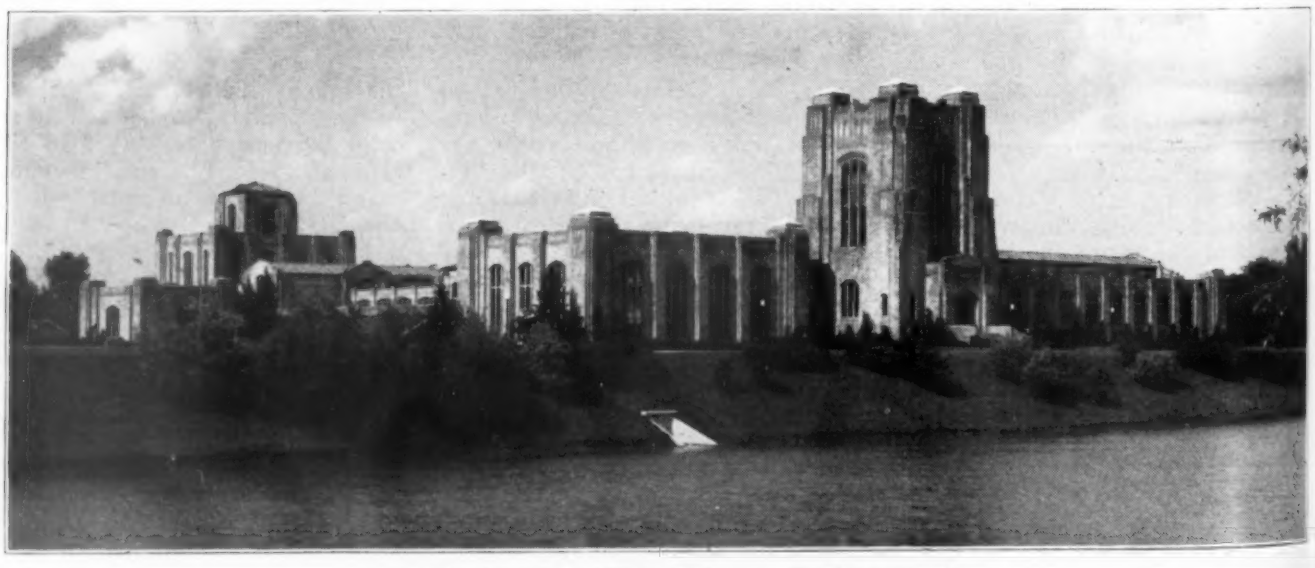
Phenol Value

The phenol value is the carbon required in parts per million to decrease the phenol concentration of a solution from .1 parts per million (100 ppb.) to .01 parts per million (10 ppb). In this case the phenol adsorbed, **X**, would be .09 parts per million (.10-.01); and **C**, the per cent of phenol remaining, would be 10; i.e., (0.01 ÷ 0.10) × 100. Hence for this condition the equation would be

$$\frac{0.09}{M} = K \times 10^{\frac{1}{n}}$$

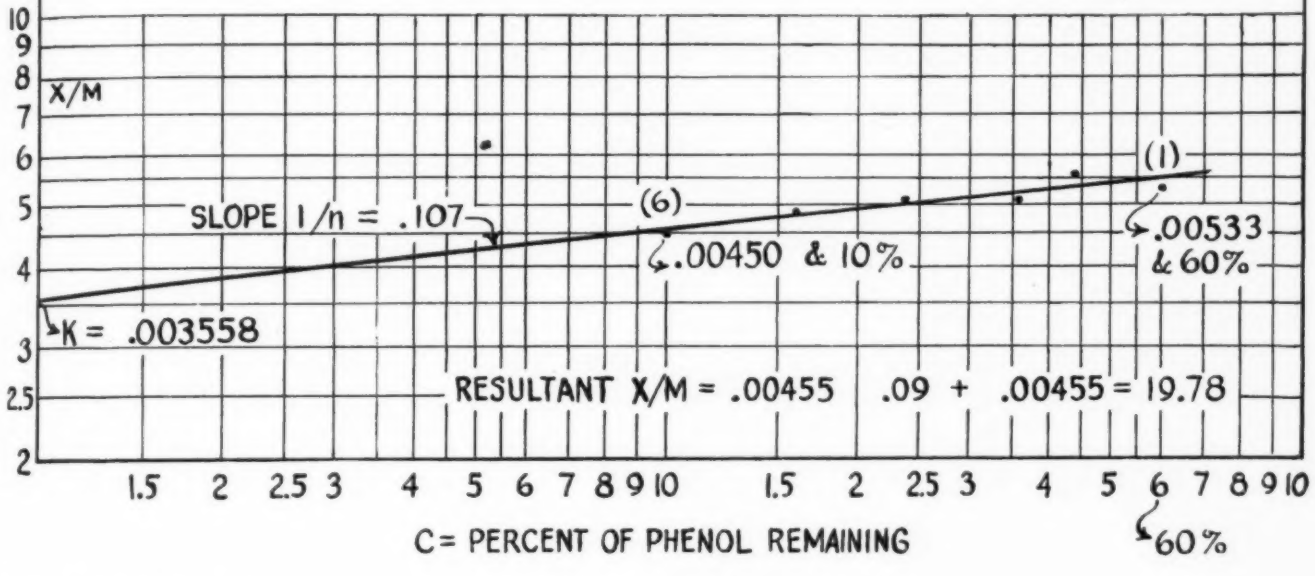
Here is an article which WATER & SEWAGE WORKS feels will be of interest to many water works men. Prepared by Ralph A. Hoot, a former water works chemist at Detroit and Ft. Wayne and now superintendent of the Ft. Wayne Sewage Treatment Works, this article shows the mathematical calculation behind the determination of the phenol value of an activated carbon.

Mr. Hoot has pointed out that this may not be a practical problem but it is a good test of one's mathematical ability and it serves to indicate what sometimes lies beyond the horizon of one's analytical work. It is a careful presentation of mathematical data based on actual filter laboratory work. For water works chemists and engineers using activated carbon this article will give excellent insight into the phenol value as a means of rating activated carbons.—The Editors.



Filtration and Softening Plant at Ft. Wayne, Ind.
(It was here that the author, then chief chemist of the water plant, first used the method described in this article.)

	PARTS PER MILLION CARBON	RESIDUAL PHENOL ppb.	PHENOL ABSORBED ppb.	C	X/M
1.	7.5	60	40	60%	.00533
2.	10.0	44	56	44	.00560
3.	12.5	36	64	36	.00512
4.	15.0	24	76	24	.00506
5.	17.5	16	84	16	.00480
6.	20.0	10	90	10%	.00450



Logarithmic Equation

The Freundlich equation in logarithmic form is as follows:

$$\log X/M = \log K + 1/n \log C$$

For the conditions of the Phenol value the equation would be

$$\log .09/M = \log K + 1/n \log 10$$

STEPS IN CALCULATION

Analytical Data

In the analytical determination six different jars each containing 0.100 ppm. of Phenol were treated with different amounts of carbon, stirred for exactly one hour, filtered and then the residual phenol determined. The actual data for the six tests are as follows:

	M Carbon Applied ppm.	Residual Phenol ppm.	C Residual Phenol as Percent	X Phenol Absorbed in ppm.
1	7.5	.060	60	.040
2	10.0	.044	44	.056
3	12.5	.036	36	.064
4	15.0	.024	24	.076
5	17.5	.016	16	.084
6	20.0	.010	10	.090

This gives six conditions for which the values of X, M and C are known. Solve for the two unknowns, K and N, by the method of least squares.

Tabulation of Data

The tabulation of data for the six tests with the log of X/M and log C is as follows:

	X	M	X/M	Log X/M	C	Log C
1	.040	7.5	.00533	7.72697—10 = —2.27303	60	1.77815
2	.056	10.0	.00560	7.74819—10 = —2.25181	44	1.64345
3	.064	12.5	.00512	7.70927—10 = —2.29073	36	1.55630
4	.076	15.0	.00506	7.70475—10 = —2.29525	24	1.38021
5	.084	17.5	.00480	7.68124—10 = —2.31876	16	1.20412
6	.090	20.0	.00450	7.65321—10 = —2.34679	10	1.00000

Equation A

Substitute the values of log X/M and log C from the above table in the Freundlich equation of

$$\log X/M = \log K + 1/n \log C$$

thus obtaining the following six equations:

1	— 2.27303 =	log K + 1.77815 × 1/n
2	— 2.25181 =	log K + 1.64345 × 1/n
3	— 2.29073 =	log K + 1.55630 × 1/n
4	— 2.29525 =	log K + 1.38021 × 1/n
5	— 2.31876 =	log K + 1.20412 × 1/n
6	— 2.34679 =	log K + 1.00000 × 1/n
	—13.77637 =	6 log K + 8.56223 × 1/n

Add these six equations and divide through by coefficient of K (= 6) to obtain equation A.

Eq. A. —2.2960616667 = log K + 1.4270383333 × 1/n

Equation B

Rewrite each of the above six equations, each time multiplying through by the coefficient of 1/n. The

coefficient of 1/n is log C. Hence, the general expression is

$$\log C \times \log X/M = \log C \times \log K + \log C \times \log C \times 1/n$$

and the first equation will be

$$(-2.27303)\ (1.77815) = 1.77815 \log K + (1.77815)\ (1.77815)\ 1/n$$

1	.....	$-4.041788 =$	$1.77815 \log K +$	$3.161817 \times 1/n$
2	.....	$-3.700737 =$	$1.64345 \log K +$	$2.700927 \times 1/n$
3	.....	$-3.565063 =$	$1.55630 \log K +$	$2.422069 \times 1/n$
4	.....	$-3.167927 =$	$1.38021 \log K +$	$1.904979 \times 1/n$
5	.....	$-2.792065 =$	$1.20412 \log K +$	$1.449904 \times 1/n$
6	.....	$-2.346790 =$	$1.00000 \log K +$	$1.000000 \times 1/n$
		$-19.614370 =$	$8.56223 \log K +$	$12.639699 \times 1/n$

Add and again divide by coefficient of log K to get equation B.

Eq. B. $-2.290801 = \log K + 1.4762158\ 1/n$

Calculation of 1/n

Subtract equation **A** from equation **B** to clear log K and solve for 1/n. (Remember, when subtracting algebraic equations change the signs on the subtrahend and add.) Hence, the equation **A** of $-2.29606167 = \log K + 1/n\ 1.42703833$ becomes $+2.29606167 = -\log K - 1/n\ 1.42703833$.

B.	-2.290802	$=$	$\log K + 1/n\ 1.4762158$
A.	$+2.296062$	$= -\log K - 1/n\ 1.4270383$	
	$+0.00526000 =$		$+ 1/n\ .0491775$

$$1/n = \frac{.00526000}{.04917751} = .107$$

Calculation of Log K

Substitute 1/n in equation **A** and solve for log K.

$$-2.296062 = \log K + 1/n\ 1.4270383$$
$$-2.296062 = \log K + .107 \times 1.4270383$$
$$-2.296062 = \log K + .1526931$$
$$\log K = -2.4487548$$

Calculation of M

With the values of 1/n and log K known, substitute in original formula of $\log .09/M = \log K + 1/n \log 10$ and solve for M. (Remember log 10 = 1.)

$$\log .09/M = 2.4487548 + 0.107 \times 1$$

In order to look up the number corresponding to the logarithm –2.44875447 this logarithm must be changed to 7.658245 – 10. The number corresponding to logarithm .658245 is 45525, and since the characteristic is 7-10 the number is .0045525.

$$\text{Therefore } .09/M = .0045525 \text{ and } M = 19.78$$

In other words, the phenol value (M) of this carbon as calculated mathematically on the basis of the analytical data given above is 19.78. This means that it took 19.78 parts per million of carbon to reduce the phenol value of the test solution from 0.10 ppm. to 0.01 ppm.

Not A Difficult Task

On the surface it would appear from the data presented that the calculation of phenol value mathematically would be an endless task. And this would be true if the calculations were made long hand. By the use of a calculator where the figures are simply put in a machine and then electrically ground out such is not the case. On many occasions the writer using a Monroe calculator had looked up the logarithms and run off the calculations for a phenol test in a matter of 20 minutes time. And this is not excessively longer than the graphic method considering that the graphic method also has a certain amount of calculations.

Graphic Solution

As stated in the introduction, the usual method of calculating the phenol value once the analytical data is completed is graphically using logarithmic paper. The graphic solution for this phenol evaluation is presented in the accompanying Chart A. This chart shows the plotting of the six points with X/M on the ordinate and C on the abscissa. The slope of the resulting straight line, 1/n, is shown as is the other constant for the carbon, K. In the graphic solution the point at which the line intercepts the 10 per cent line is read across to get the result X/M. In this case "resultant" X/M was read as .00455. Since X = .09, .09/M = .00455 and M = 19.78.

Theoretical M and C

There are two additional steps that can be applied to this problem. These steps may be of interest to those mathematically inclined. One is the determination of the theoretical M (ppm. carbon) to give the actual C obtained. The other is the determination of the theoretical C corresponding to the actual M applied.

The writer did not happen to work out the theoretical M for the carbon described above, but did for another. Here are the data on this second carbon, designated Carbon Y.

	Actual M	Analytical C	Theoretical M Corresponding to Analytical C
1	7.5	60	7.91
2	10.0	47	10.89
3	12.5	43	11.88
4	15.0	35	13.99
5	17.5	28	16.06
6	20.0	14	21.41

For point number two the expression would be $.053/M = .0026447 \times 47$ raised to the .158391 power.

Theoretical C

Theoretical C is not so simply obtained. Theoretical M is a straightforward calculation. Theoretical C, however, works into an expression which permits of no further algebraic solution and must be solved by the method of trial and error.

For point two on carbon Y the expression is C + 26.477 C to the .15839 power = 100. By trial and error the number finally found for C was 50.74 and the expression was 50.74 + 26.477 × 50.74 to the .158391 power = 100. The left side of this expression however, only equals + 99.99932. Therefore, C as 50.74 is still .007 from the theoretical.

What this means is that for carbon Y to satisfy the Freundlich equation, the 10 ppm. of carbon applied should have given an absorption of .04926 ppm. (.05074 residual or 50.74 per cent remaining) instead of the .053 ppm. actually obtained (.047 residual or 47 per cent remaining). As shown in the table above, in order to get .053 absorption it would have required 10.89 ppm. instead of 10.0 ppm.

(For persons interested in the calculation of the theoretical C and M, the author has the complete calculations for Carbon Y.)

Acknowledgment

The writer wishes to acknowledge the assistance, some years ago, of Robert Hulbert of the Water Works Park Filtration Plant in Detroit. When the writer first desired to attempt this method of calculation, Mr. Hulbert confirmed the applicability of the method and gave an example of the technic.

HYDRAULICS FOR THE PRACTICAL WATER WORKS MAN

The Twelfth of a Series of Articles

Flow in Streams, Drains and Open Channels

By ROBERT W. ANGUS, M.E.*
Consulting Engineer
TORONTO, CANADA

(*Prof. Emeritus of Mechanical Engineering, University of Toronto)

So far attention has been confined to what are called "closed channels," such as pipes, in which the flowing liquid completely filled the conductor carrying it and where the fluid could be under any desired pressure. There are a great many cases, however, where the surface of the water is at atmospheric pressure, a condition common to sewers, drains, ditches, rivers, etc. and these cases are included under the head of "open channels."

The flow in them may be discussed under the same general laws as apply to closed channels, or pipes running entirely full, but there are certain differences that must be recognized, as, for example, the fact that the closed pipe may run over hills and down valleys following in general the contour of the ground, but it is well known that open channels, such as sewers and rivers must always slope downward in the direction of flow. This is the reason for the elaborate and beautiful viaducts constructed to supply Rome with water, and demands the location of an open channel with much greater care than is necessary in the laying of pipes running under pressure.

In addition to this difference the velocity in a closed pipe full of water is proportional to the discharge and any change in the latter produces a corresponding change in the velocity. This statement is not generally true of the open channel for the depth of the water, and consequently the cross-sectional area of it, may, and usually does, vary with the discharge and it is quite conceivable that an increase in discharge may correspond with a decrease in velocity, because the area of the water may increase more quickly than the discharge. While these differences are at once evident, and others will appear as the article develops, yet the laws already laid down enable problems in open channels to be dealt with satisfactorily.

The Author

Flow in Train

The drawing on Fig. 43 shows longitudinal and cross sections of a drain pipe, or sewer, or ditch. The slope of the bed is always small, such as six inches per mile in many rivers, one foot per mile in some sewers, while one foot per mile has been used in large power canals; this is done to keep the velocity of the water low enough to prevent destruction of the bottom and sides of the canal. The two sections, 1 and 2, are **l** ft. apart and the depths at the sections are $\mathbf{d_1}$ and $\mathbf{d_2}$ respectively. In many practical problems both the shape and area change between the two sections; consequently there is a change in velocity from one to the other.

While hydraulic problems dealing with such cases usually offer little difficulty, yet they involve a more intricate treatment than it seems advisable to bring into this series. The study here will, therefore, be confined to the simplest case, namely that where the cross-sectional area of the water and the shape and dimensions of the channel remain unchanged throughout its entire length, and where the slope of the bed is also uniform. This is the case commonly treated in general hydraulic studies and is the condition assumed in design; it is described as *flow in train* and obviously the water surface is parallel with the bed of the channel.

The datum will be assumed through the bed at section 2, as indicated, and since the depth of water at any point corresponds to the pressure **p** on the bed at that point it is evident that, if elevation heads are measured up to the bed, then the hydraulic gradient coincides with the water surface and the resistance line is parallel with the surface and $\frac{v^2}{64.3}$ ft. above it.

Inasmuch as the velocity in open channels is usually low, the velocity head is generally small, although it may be as large as one foot or more. As all water cross-sections are assumed to be equal all velocity heads will be the same, and, further, the sum of the elevation head and the pressure head will always be the distance from the datum to the water surface and it follows that the friction head **F** ft. lost between sections 1 and 2 is simply the drop in the water surface between these two points. The slope of the hydraulic gradient, $\frac{F}{l}$ is therefore also the slope of the water surface and of the bed. This slope $\frac{F}{l}$ is usually designated by **s**.

In the fourth article of this series considerable attention was given to the method of calculating **F** in case of a closed, round pipe, and that article should be read again in connection with the present one, for the same basic laws apply to the open channel as to the former case. The law used for the pipe was $F = f \frac{l}{d} \times \frac{v^2}{64.3}$ where f was a term having mainly to do with the roughness of the inside wall of the pipe, although it was stated in the article that f also varied to a certain extent with the velocity and the diameter. The diameter d entered

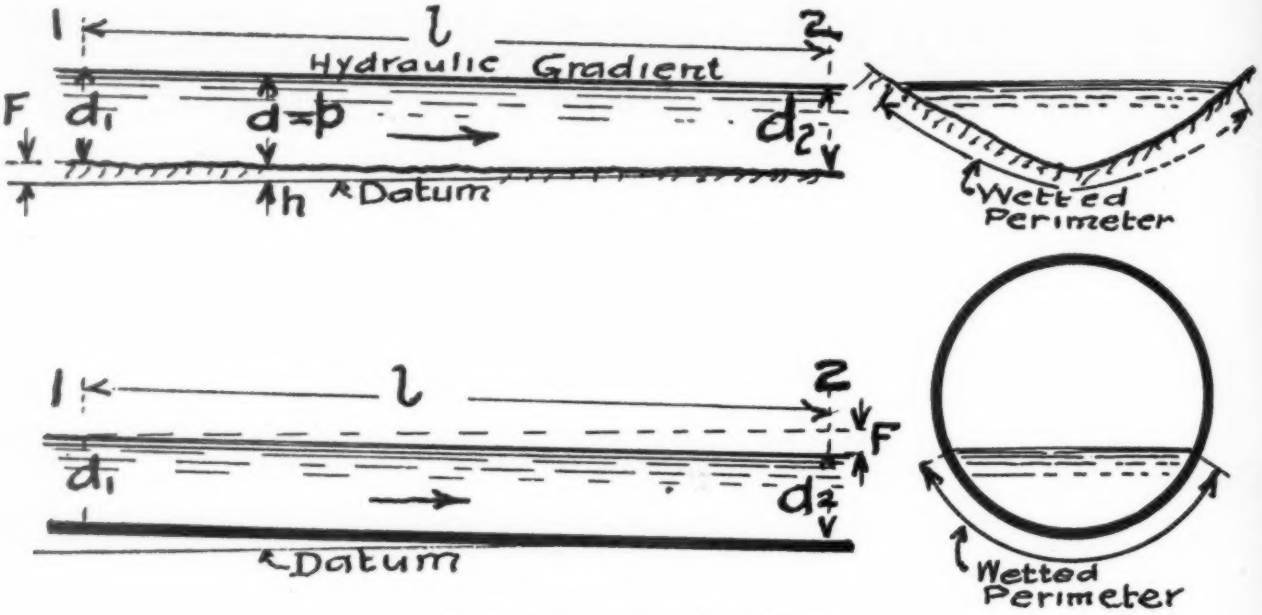


Fig. 43. Two Forms of Open Channel

in because it was a measure of the mean distance of the particles of water from the pipe walls, which are primarily the cause of the friction loss.

Formula To Be Used

If the same type of formula is to be used for open channels what dimension in the open channel will correspond with **d** in the pipe? Evidently it must be a dimension proportional to the mean distance of the particles of water from the bed, and this dimension has been arrived at in a somewhat curious way, perhaps best illustrated (although not too satisfactorily) by assuming the water flowing in a rectangular trough.

Suppose this trough is 6 ft. wide with a depth of water of 2 ft., so that the cross-sectional area of the water is 12 sq. ft. and, of course, no drop of water can be more than 2 ft. from the bed. The *wetted perimeter* of this cross section, that is the length of the perimeter in contact with the water is $2 + 6 + 2 = 10$ ft. and dividing this length into the area gives 1.2 ft. If, instead of these proportions, the width were 12 ft. and the depth 1 ft. the area would be the same as before, but the wetted perimeter would now be 14 ft. and by dividing this into the area, as before, gives 0.857 ft., which is smaller than in the former case and also the average particle is closer to the bottom than before, whereas a channel 8 ft. x 1.5 ft. would still have the same area but a perimeter of 11 ft. and the quotient $\frac{12}{11}$ is 1.09 ft. which is between the other two, as is also the maximum distance of any drop of water from the bed.

Very many experiments and studies have shown that this quotient is in every case in practice, a measure of the effect on its flow of the distance of the average drop of water from the wall. In the above example, the curious case arises that a 6 ft. x 2 ft. trough has the same perimeter as a 4 ft. x 3 ft. one and yet the maximum distance of the drops from the walls is not the same in the two cases, apparently. This in no way affects the accuracy of the statement made but suggests that in trying to simplify the matter the author has not made a comprehensive enough explanation. Actual results fully justify the statements.

Hydraulic Radius

The quotient, area divided by wetted perimeter is called the *hydraulic radius*, or hydraulic mean depth, and is denoted by **r**; it performs exactly the same function in the formula for open channels as **d** does in the closed pipe formula. It is also true that **r** is proportional to the size of the canal, as is easily seen by a few trials; for example, in the 6 ft. x 2 ft. channel above **r** was 1.2 ft. while in a 12 ft. x 4 ft. channel it would be 2.4 ft.

With these explanations it is possible to write the relation $F = f_1 \frac{l}{r} \times \frac{v^2}{64.3}$ for the open channel, and this is more commonly written in the form $v = \sqrt{\frac{64.3}{f_1}} \sqrt{\frac{F}{r}\frac{r}{l}}$ But $\frac{F}{l}$ has already been designated by **s** and is the slope of the bed, which is the same as that of the water surface, while f_1 like **f** in the pipe formula, depends very largely on the condition of roughness of the bed and walls. Usually $\sqrt{\frac{64.3}{f_1}}$ is denoted by the coefficient **c** which depends almost entirely on the roughness of the bed and walls, although like **f** it also varies with **r** and **v** as well. But since **v** varies with **s** it is more common to say that **c** varies with **r** and **s** as well as with the roughness.

Chezy Formula

Putting these values in the formula gives it the form $v = c\sqrt{rs}$, which is known as the Chezy formula, from its discoverer, and it is used almost universally for flow in open channels, and quite frequently for closed pipes as well. The quantity **s** always denotes the slope of the hydraulic gradient and for open channels operating under the conditions named it is also the slope of the bed and also of the water surface but for closed pipes flowing full the slope of the pipe line may have little connection with the slope of the hydraulic gradient.

In fact while the hydraulic gradient slopes downward in the direction of flow it is always desirable to have the closed pipe line slope upward in that direction so that any

air freed from the water will be carried along with it and not collect in the pipe. The values of the coefficient **c** vary greatly because of the great variation in size, shape and roughness in open channels which include glazed tile sewers, brick sewers, wooden troughs, concrete lined ditches and drains, ditches in earth where the bed is sometimes smooth and at other times rough and stony and often with grass and weeds growing in them.

The water works man is not much interested in the elaborate formulas that have been devised for giving a value of **c** to suit each case but he should be reminded that one of the most commonly used is that of Kutter, who included in his formula a term **n** to denote the degree of roughness, and this term **n** is in such common use that engineers with some experience indicate the condition of the bed by giving the value of **n** for it. If, for instance, they were told that a certain channel had a value of $n = 0.015$ they would know that it had a bed of about the same smoothness as vitrified sewer pipe.

Kutter's 'n' for Roughness

A few values of this coefficient of roughness **n** are as follows: Neat cement finish 0.010, brass pipe 0.011, coated iron pipe 0.013, unplaned board lining 0.014, galvanized iron pipe and vitrified sewer pipe 0.015, and for natural earth it varies from 0.023 when clean and straight to between 0.03 and 0.04 where there are weeds and stones. Since it has been found that the value of **c** varies almost exactly as $\frac{1}{n}$ in a channel, it is most desirable to keep the walls and bed smooth, for if when the channel was new and clean **n** was 0.023 and it was later to have a growth of weeds which increased the value of **n** to 0.034 then the capacity of the channel would only be approximately 23/34 what it was at first for the same depth of water. The effect of roughness cannot be over emphasized.

For convenience, values of **c** are plotted on the curves on ***Fig.* 44,** which cover the usual cases met with in water works practice, but very complete tables of values will be found in King's *Handbook of Hydraulics* (McGraw Hill Book Co.) and also in *Hydraulic Tables* of the Corps of Engineers, War Department, and sold by the Superintendent of Documents, Washington, D. C. For a good, smooth concrete trough 4 ft. wide and carrying water 1 ft. deep, the bottom slope being 1 ft. per 1000 ft., or $s = 0.001$, **n** should be about 0.014 and the hydraulic radius would be $r = 4/6$ or 0.67 ft. for which values the curve gives a coefficient **c** of 98. The velocity in the trough would be

$v = 98\sqrt{0.67 \times 0.001}$ or

2.54 ft. per second with

a corresponding discharge of 4 x 2.54 or 10.2 cu. ft. per sec., which is equal to 4590 U. S. gallons per minute. If this concrete became so dirty that the value of **n** rose to 0.20 then **c** would decrease to 65, which is nearly 14/20 of 98, and the discharge would drop to 3045 U. S. gallons per minute.

Some care would need to be exercised in the design of the above trough to see that a gradually tapering approach channel was made, which would very gradually speed up the water and thus avoid large entrance losses. If the trough was 500 ft. long then the friction loss in it would be 500s or 0.5 ft., and if the trough connected two reservoirs the difference in levels between them would be 0.5 ft., plus the entry and exit losses. These latter together might be nearly twice the velocity head or 2 x 0.1 ft. which would make a difference in levels between the reservoirs of 0.7 ft., that is 8.4 in. The velocity in this trough is quite satisfactory, but could not be used in an unlined channel, as it would probably wash out the bed.

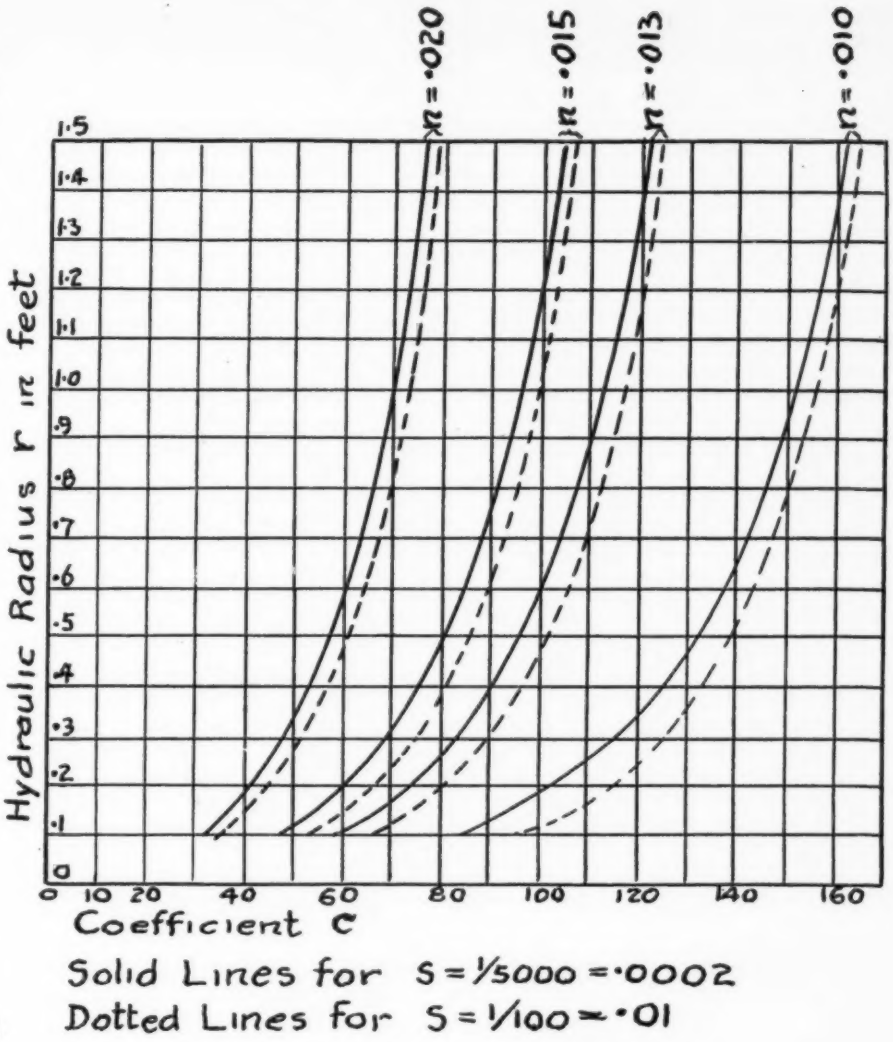


Fig. 44. Values of c in Chezy Formula, $v = c\sqrt{rs}$

Discharge of Round Channel

If a 2 ft. diameter round concrete pipe had been used instead of the rectangular trough, and the pipe was lined with neat cement it would have a value of 0.010 for **n**, and if this pipe was laid below the hydraulic gradient, so as to be always full, the water area would be 3.14 sq. ft. and the wetted perimeter 6.28 ft. giving a hydraulic radius of 0.50 ft. If the reservoirs were to have the same difference in levels as before, and the same entry and exit losses are assumed, the loss of

head in friction would be 0.5 ft. as before, so that the slope of the hydraulic gradient would still be 0.001 (although the pipe itself would probably slope upward). From Fig. 44 the estimated value of **c** is 135 and if these values are placed in the Chezy formula the velocity is found to be 3.02 ft. per sec. and the discharge 3.14 x 3.02 or 9.48 cu. ft. per sec.

Had the 2 ft. pipe been raised till its centre line was on the hydraulic gradient it would run half full and would have the same hydraulic radius 0.5 ft. as before, so that it would have the same **c** and the same velocity of 3.02 ft. per sec., but its discharge would be cut in half because the water area is reduced in this proportion. For this case the pipe would need to be carefully laid to grade throughout.

Lined and Unlined Channels

Where channels are lined with a material that water cannot damage, quite high velocities are permissible, and these may even exceed 8 ft. per sec., but particular care must be taken to avoid high entry and exit losses, as these may easily exceed the friction loss.

Where the channel carries an unclean liquid, such as sewage, the velocity should be high enough to prevent the solids from falling to the bottom or sticking to the sides, for this would raise **n** and lower the capacity. For sewage, 2 ft. per sec. is generally high enough to prevent trouble but for other fluids it may be necessary to determine this value by experiment. On the other hand unlined channels must not have too high a velocity or the bed will be washed out. Fine sand is moved by a velocity of 1.5-2 ft. per sec., fine gravel by 2.5-4 ft. per sec. but firm loam will stand 2.5-3.5 ft. per sec. These velocities are for clean water, but if there is sand or corrosive material in it these must be placed somewhat lower.

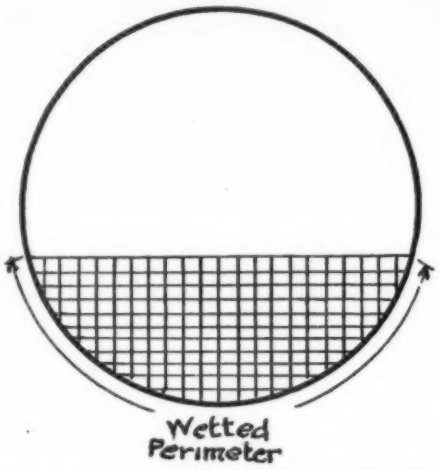


Fig. 45. Method of Finding Hydraulic Radius r.

The Hydraulic Radius 'r'

For channels of simple and regular shape there is no trouble in getting the value of **r** and in circular channels flowing full or half full the hydraulic radius is always one-quarter of the diameter, but for other depths and for irregular channels it is not so easy to get. The cross section of the water, however, can always be plotted accurately either full size or to scale, and if a planimeter is handy the area may readily be measured. Usually such is not the case and then the area may be divided up into small squares, as shown on Fig. 45, and the number of these can be counted which will give the area in square feet. The only way to get the wetted perimeter is to set a pair of compasses an even distance, such as one inch, apart and then "step off" the perimeter from the drawing. This method will give very good results if the squares are small enough and the distance apart of the compass points is not too large.

It must be remembered that this treatment of open channel flow applies only to the case where there is **flow in train,** the water surface being parallel to the bed and all water cross sections are of the same shape and size. It must not be applied to other cases.

"Doc" Taylor Resigns as Asst. City Mgr. at Roanoke

Becomes Genl. Manager for Baton Rouge Water Co.

D. R. Taylor

D. R. ("Doc") Taylor, Ass't. City Manager for Roanoke, Va., and earlier Superintendent of the Roanoke Water Dept., has resigned from his Roanoke post which was created for him as a stepping stone to the office of City Manager upon retirement of Veteran City Manager Hunter within the year.

As he was a regular contributor to these pages, readers of *Water & Sewage Works* have benefitted greatly from "Doc" Taylor's highly practical articles, which for the most part have found a permanent spot in the several annual Reference and Data numbers of *Water & Sewage Works.* While serving first with the Roanoke Water Co., and later the Roanoke Water Dept., "Doc" Taylor developed into a public relations man of marked acumen, in addition to his ability as a water works engineer. Fact is he "public relationed" himself into the proferred City Managership which he has now forsaken for his old love —water works operation. Now he has accepted General Managership of the Baton Rouge Water Works Co. of Baton Rouge, La., where he will be located even before this item gets into print.

During World War II, Major Taylor made an outstanding contribution by way of his services as Utilities Engineer in the Corps of Engineers. Upon his refusal to reconsider his resignation for his potential job as City Manager of Roanoke, Mayor Edwards explained to a strongly supporting Roanoke Press—"There appeared to be no way for the City to hold him," whereupon many columns of comment broke forth and a 15 inch editorial wanted to know how come Roanoke couldn't hold city officials of the Taylor caliber and ability.

Nice going "Doc," and may you do as good a job technically and public-relations-wise for the Baton Rouge Water Co. as you did for Roanoke's Water Utility.

Pottstown, Pa., Acquires Water Company

After ten years of negotiation the Borough of Pottstown, Pa., has acquired the Pottstown Water Co. and will assume operation of the properties about September 1. At the same time the borough is rehabilitating a fire alarm system and fire alarm equipment.

For these two projects the Borough has sold bonds, the water acquisition bonds totalling $1,500,000 on an interest basis of 1.35 per cent.

Dow I. Sears is Borough Manager of the Borough of Pottstown.

WATER PURIFICATION TOPICS

A Digest of Papers Presented Before the Water Purification Division of A.W.W.A. in San Francisco July 21-25, 1947

A Report by
HARRY A. FABER‡
EDITORIAL ASSOCIATE

DURING the A.W.W.A. Conference in San Francisco, three sessions were devoted to papers covering problems of water purification and water conditioning. The first session of this division emphasized practice in sampling water in a distribution system, the disinfection of water mains, and pollution experiences.

Retiring Chairman
Cecil K. Calvert
Supt. Filtration
Indianapolis Water Company

New Chairman
Chas. R. Cox
San. Engr.
State Dept. Hlth.
Albany, N. Y.

"Selection and Control of Sampling Points in a Distribution System," by K. W. Brown, Cons. Chem. Engr., San Francisco, Calif.

Mr. Brown, formerly a water works chemist, reviewed the 1946 Water Quality Standards as they relate to water sampling and testing, pointing out that this practice is now required as routine procedure. In addition to the quality of finished water at the plant the quality of the water as it reaches the consumer is now receiving major attention also. The selection of representative sampling points and the frequency of collecting samples must be carefully determined.

For small water distribution systems, Mr. Brown considered the problem easily solved by dividing the system into zones and plan sampling to cover each zone at least once each month. For large distribution systems, it is important to determine population density and to base the sampling procedure on this factor. Another factor must be included when the distribution system is served by multiple sources of water supply. A critical appraisal of all cross connections and other potential hazards is required for true evaluation of representative sampling.

Sample collection may be assigned to pump operators or to chlorinator operators in small systems, but special sample collectors should be utilized in large systems. Variable, rather than fixed sampling points, are considered more desirable. From a good public relations point of view, it is desirable to select sampling points where customers will realize tests of the water are being made; at public schools, for instance.

The author recommended: (a) Plastic cap bottles sterilized by autoclaving (though not all types of plastic caps are satisfactory); these bottles, preferably having a rubber ring or gasket, are less expensive than wide mouth glass stoppered bottles. (b) Aluminum foil, 0.0001 gage, cut in 5 in. squares or circles is best for covering glass stoppered bottles and is considered optional for plastic cap bottles. (c) All samples from chlorinated supplies should be dechlorinated, and the thiosulfate is best added as solution. (d) Allowing water to flow from a tap for 3 to 4 min. before collecting the sample is preferred to flaming the tap. (e) On the basis of operating experience it does not appear that refrigeration of samples is necessary, even in shipment of samples by mail; however, the evidence is not conclusive and Mr. Brown suggested that a cooperative study of sample refrigeration would prove beneficial.

In the discussion which followed, it appeared that a number of operators believe the flaming of sampling taps to be desirable. One member stated he had found results to be satisfactory when mail shipment of treated waters was practiced, but erratic and unsatisfactory results were obtained when raw or settled waters were shipped without icing.

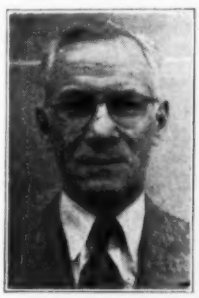
‡Research Chemist, The Chlorine Institute, Inc., New York.

It is greatly regretted that this third installment of the report, covering the San Francisco Convention of the Am. Water Works Ass'n., could not be included in our October number as originally planned. Even at this late date, since the San Francisco convention, we are printing Mr. Faber's report which we believe many will find of considerable interest, pending the appearance of the papers in the *AWWA Journal*.—Editor.

"Why (and How) Disinfect Water Mains?" by C. K. Calvert, Chairman, Water Purification Division, Indianapolis, Ind.

Reporting as chairman of the A.W.W.A. Committee on Recommended Procedure for Disinfection of Water Mains, Mr. Calvert answered the question "Why disinfect water mains?" with the question "Why disinfect anything?" The answer to both questions is supplied by an examination of mortality rates: disinfection is essential as a protection from intestinal pathogens. There are many possibilities for contamination of cast iron pipe before and during the laying of mains. The coliform organisms found in water from new or repaired mains are only "tracer" or ganisms, but they do provide evi dence of contamination.

No universally satisfactory procedure can be specified for the practice of water main disinfection, but some judgment must be used in applying any standard procedure. While flushing is important after the main is laid, and swabbing and cleaning before connecting is desirable, extensive experiments show *prevention* of contamination could be best



Retiring Secretary
I. M. Glace
Consulting Engr.
Harrisburg, Pa.

New Secretary
Jas. E. Kerslake
Supt. Filtration
Milwaukee, Wis.

accomplished by sealing pipe at the factory—and this may be accomplished in the future. The contamination of hemp can be corrected al-

Programmers

Kenneth W. Brown
Consulting
Chemical Engr.
San Francisco

Paul D. Haney
Prof. San. Eng.
Univ. No. Carolina
Chapel Hill, N. C.

most entirely by adding an organic mercurial to this joint packing material; even so, hemp is not a preferred material.

Mr. Calvert directed attention to a final footnote of the committee report (soon to be published) describing a method of treatment which specifies the continuous maintenance of a 0.5 ppm. free available chlorine residual in the newly laid or repaired main. The committee believes this is the best practice so far developed, since immediate use of the line is permitted when such treatment is followed, and the water will be safe for consumers.

"Preliminary Report of Committee on Open Air Reservoirs," by N. J. Howard, Director of Water Purification, Filtration Plant, Toronto, Canada.

Mr. Howard presented this paper as a progress report of his committee, without offering any recommendations at this stage of the investigation. The work to date has consisted of assembling data through the cooperation of state sanitary engineers of the U. S. and Canada; the 53 replies to questionnaires represents a 93.6 per cent return. Analysis of the information submitted reveals that a "tremendous hazard" exists in potential pollution from open reservoirs, and the report submitted is designed to stimulate discussion of the problem.

In general, the data show that, while 43 state sanitary engineers—of the 53 replying—now approve open reservoirs, every one prefers covered reservoirs. The majority say that existing reservoirs should be covered and should be protected by a high wire fence if not covered. The best evidence that all reservoirs should be covered is the admission that bathing or fishing is frequently permitted. The feasibility of maintaining residual chlorine through small open reservoirs as a protective measure was emphasized.

"Pollution of Potable Water by Macroscopic Organisms," by J. C. Weart and C. W. Klassen, Engineer and Chief Engineer, respectively, Division of Sanitary Engineering, State Dept. Pub. Health, Springfield, Ill.

Relating in their state, the authors described the significance of certain organisms and the water pollution problems they presented. The recognition and handling of such problems frequently involves a broad knowledge of fresh-water biology.

The presence of iron-fixing bacteria in wells and their growth in coke tray aerators requires special treatment. Nitrifying bacteria are frequently found where waters provide high ammonia concentrations for their food supply. Copper, as copper sulfate, in conjunction with chloramines — maintaining about 1.0 ppm. of copper—has been found a successful treatment and is employed in three water supplies of the state. The presence of chromogenic (color-producing) bacteria has been correlated with the use of meta-phosphates for water treatment.

Copper sulfate has also been found to provide a successful means for controlling growths of snails in distribution systems. A most resistant macroscopic organism encountered has been the bloodworm or midge fly larvae. These are so small that 24-mesh window screen is required to strain them out. Heavy doses of chlorine will bleach out the color from such worms, but is reported not to kill them. Treatment with DDT is effective—however, water so treated should be pumped to waste.

Wastes from Water Treatment

W. W. Aultman, Water Purification Engineer, Metropolitan Water District of Southern California, La Verne, Calif., Chairman of the "Committee on Disposal of Wastes from Water Purification and Softening Plants" presented a report designed as a study of methods and practices. Members of this committee, in addition to Mr. Aultman are: Dr. A. P. Black, Univ. of Florida; Harry R. Hall, Washington Suburban Sanitary District; Paul D. Haney, Univ. of North Carolina; and Chas. P. Hoover, Columbus, Ohio. Three of the members participated in this symposium.

"Disposal of Brine from Water Softening Plants," by Paul D. Haney.

Usually from 5 to 10 per cent of the volume of water treated in zeolite softening plants is discharged as wash water, and this contains a high concentration of calcium chloride and of unused salt. These must be considered pollutional substances if they reach public water supplies, since the U.S.P.H.S. recommends that not to exceed 125 ppm. magnesium, 250 ppm. chlorides, or 500 ppm. total solids shall be present. Such substances also affect sewage treatment, as brine is very corrosive to metals and may upset secondary treatment processes. If high concentrations are discharged in short periods of time, chlorides will kill fish life.

A survey of disposal processes indicates the complexity of this problem. Disposal ponds show low evaporation and high seepage rates —the salt absorbed is bad for surrounding soil. Disposal by dilution is satisfactory when the volume of diluting water is adequate and when storage is provided for uniform discharge. Disposal by means of brine disposal wells has proved quite suitable and is widely used by the oil industry.

"Wastes Resulting from Sludge and Sediment from Coagulation," by Harry R. Hall (paper read by Dr. A. P. Black).

This problem appears to merit more attention, since there is no general practice for sludge disposal and usually no treatment whatever is provided. In order of general usage, present water treatment sludge disposal methods are: (1) Discharge directly to streams; (2) Sedimentation preceding discharge to streams; (3) Disposal into public sewers; (4) Settling in lagoons

Programmers

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Hyattsville, Md.

A. P. Black
Prof. of Chem.
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or sludge beds; and (5) Return to reservoirs.

Where prechlorination is practiced in the filtration plant, the danger of bacterial pollution is very slight. The turbidity increase in a receiving stream is not considered a health hazard, but since sludge may be deposited, the dilution provided by the stream should be taken into consideration. The sludge solids, consisting of raw water turbidity, coagulating chemicals, and perhaps activated carbon, will settle readily if a short detention period is provided. It was suggested that designing engineers should give more consideration to this problem of sludge disposal at water treatment plants.

"Disposal of Sludge from Lime and Lime-Soda Softening Plants," by W. W. Aultman.

Because this nation is becoming aware of the undesirability of stream pollution, and also of the advantages of soft water, a somewhat complex situation is created. The calcium and magnesium compounds, and the organic matter constitute the principal constituents of wastes from the lime and lime-soda water softening processes. Disposal of such wastes is generally by lagooning (most plants use this practice), by discharge of the wet sludge into a stream, by partial or complete dewatering and utilization of the sludge, and by dewatering and calcining for reuse of the lime.

When such sludge is partially or completely dewatered, it is sometimes used for "sweetening" acid soils. This may even be practiced on a commercial scale if a permanent market exists. After extensive investigation of the calcining and lime recovery method, it is expected that three softening plants will soon have this practice in use. Removal of magnesium is essential and may be accomplished either by precipitation or by centrifugal treatment. Rotary kilns are now employed to treat similar sludges; calcining furnaces seem well adapted for lime sludges.

Programmers

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Director
Water Purif.
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U. S. Engrs. Office
Washington

Mr. Aultman noted that a softening plant in Southend, England, has calcined lime softening sludge effectively since 1929. In the United States, Miami plans to practice lime recovery by calcining at its 60 mgd. plant beginning in the fall of 1948. Marshalltown, Iowa, has a 4 mgd. plant where flash drying and calcining is practiced. The Dorr Company has been investigating equipment designed to produce 6 tons per 24 hours and plans to operate early in 1948. The Metropolitan Water District of Southern California plans to calcine sludge when the capacity of its 100 mgd. plant is doubled.

Present market conditions indicate lime recovered from water softening sludges could be sold readily, having a value as great as that of commercial lime. The investigations of this committee are to continue and all interested members of the A.W.W.A. were urged to take an active interest.

In discussion, it was pointed out that commercial value of lime so produced will be dependent on the maintenance of a constant chemical quality. It must contain no silt and must be low in magnesium content. A net profit of $100,000 per year is predicted for the Miami plant when the recovery process is in operation.

"Separation of Water from Solid and Liquid Mixtures," by A. A. Kalinske, Chief Hydraulic Engineer, Infilco, Chicago, Ill.

In a general discussion of the problems involved in separating water and the solids which it carries, Mr. Kalinske described the design features of settling basins and clarifier units. The settling characteristics of various solids must be known, the concentration of the solids is an important factor and, assuming a constant temperature, these characteristics determine the rate of mass settling or compaction.

The area of such units (that is, the upflow rate) is a more important consideration than the volume determined by the cubic contents. However, depth cannot be neglected, since the removal of water becomes impractical in a very shallow basin. In the newer high-speed water softening slurry devices, upflow through a suspension of large particles (velocity) and settling characteristics of the suspension (rate) determine the efficiency of removal. In a slurry the settling characteristics of the individual parts of the slurry are greater than that of the total mass. By recirculation of slurry, it was pointed out, the upflow velocity of the applied water can be increased.

Programmers

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"Control of Slime Growth in Transmission Lines," by R. L. Derby, Chief Sanitary Engineer, Dept. of Water and Power, Los Angeles, Calif.

In an unusually comprehensive paper, Mr. Derby described the experience of Los Angeles and other municipalities in the application of various methods for controlling biological growths in water lines. While the prevention and control of corrosion must be routine practice, it should be equally important to recognize that concrete pipe and even cement lined steel mains decrease in carrying capacity due to slime growths on the interior pipe walls. Examination of the latter types of lines frequently show the presence of crenothrix and other types of iron-fixing bacteria, freshwater sponges, etc. It is important to establish the original "C" and "N" values for water transmission lines in order to evaluate data on flow losses or higher pumping heads at a later time.

The experiences cited by the author included reduction of an estimated "C" value of 100 to a value of 65 in a 7500 foot long fourteen inch line after 3 years use. The water involved contained hydrogen sulfide (partly eliminated by aeration) and the trouble was caused by slime coating due to gowth of the sulfur organism beggiatoa. Chlorine was applied (75 to 100 pounds daily) and a residual was obtained at the end of this line only after several months of application. This experience, and results obtained by others, indicates the maintenance

of about 0.35 ppm. residual chlorine will eliminate most difficulties.

Under certain conditions, it is still essential to resort to periodic mechanical cleaning of water lines. In one instance, a heavy growth of fly larvae occurred in an invert siphon—copper sulfate was applied without improvement, chlorine accomplished some benefit, but was not a permanent help, and mechanical cleaning with inflated rubber beach balls was found cheaper even though repeated use was required. In another instance, a 60 mile line was heavily coated with fresh-water sponge growth (about one wheelbarrow load per foot of pipe length) —because of low flow in this line the organism might have been killed by chemicals but would not have been flushed out; wooden balls tied in a loose sack were run through the line and cleaned so satisfactorily that its capacity was restored close to that originally existing.

In the San Diego conduit system, copper sulfate has proven successful for killing growths of pipe moss. Because of the high alkalinity of the water it is necessary to apply small doses of this chemical at frequent intervals. Since 1943 the copper sulfate treatment has been used a number of times by San Diego in the treatment of a 125 mile aqueduct—always with some benefit, but never with very lasting results. In 1945, heavy chlorine application (two tons applied within eight hours) was found to produce some increase in flow. The best procedure and the most economical one has been found to consist of regular chlorination to maintain 0.2 to 0.3 ppm. residual through the system. Where the water is exposed to sunlight, however, the effectiveness of chlorine will be reduced.

Superchlorination in Toronto and Washington

"Superchlorination and Dechlorination Experiences," by N. J. Howard, Director of Water Purification, Toronto, Canada, and C. J. Lauter, Senior Chemical Engineer, U. S. Engineers' Office, Washington, D. C.

The review of superchlorination practice presented by Mr. Howard included a summary of the early work of Sir Alexander Houston (with whom Mr. Howard discussed the Toronto taste and odor problems), a description of the early experiments with superchlorination at Toronto during 1921, and 1922, and details of the first systematic application of this practice on the Toronto supply in 1926. Mr. Howard's paper reported so extensively on the development of this practice and with reference to the results obtained at Toronto that publication of his complete paper will be awaited with interest.

Mr. Lauter described the application of super—and dechlorination practice, involving sulphur-dioxide application, at the Dalecarlia filtration plant of Washington, D. C., where this treatment has now been in use for a year and a half. The history of chlorination, in the treatment of this supply, began with the adoption of post-chlorination for disinfection in 1923. Then, in 1930, pre-chlorination was added and, with the advent of taste and odor troubles, chloramine treatment was started three years later. The use of aqua ammonia replaced anhydrous ammonia in 1940.

Studies made prior to 1946 failed to show that the raw Potomac River water exhibited the characteristic break-point, and that chlorine residuals above 0.3 ppm. were undesirable; consequently, it appeared that dechlorination would be required when superchlorination treatment was used. This practice was first applied by feeding sulfur dioxide gas from cylinders of liquid SO_2 through rotameters, but regular vacuum chlorinators were soon found more satisfactory for the purpose. Sodium metabisulfite has been tried on plant scale as the dechlorinating agent, employing a 30 per cent solution fed through rubber lined pipes by means of proportioning pumps. The high vapor pressure from released sulfur dioxide proved undesirable and the plant returned to the use of liquid sulfur dioxide.

During the past year, the prechlorination dose applied has varied from 3.5 to 4.5 ppm., utilizing a two and one-half to four hour contact period. Until May, 1946, the treated water was dechlorinated just ahead of the rapid sand filters, but since that date dechlorination has been applied *after* filtration. With present practice, the maintenance of free available residual chlorine in the distribution system has proven more successful.

During periods when the chlorine demand of the raw water is high, it is impossible to maintain a free available chlorine residual with the present chlorinator capacity, and additional equipment is being added. Good control of tastes and odors is now accomplished, and practically 100 per cent bacterial kill is attained (average 24 hour count in the distribution system is 2.0 per ml.). Since dechlorination has been in use, plant operation has been simplified and, in this treatment, residuals of either free or combined available chlorine can be maintained at will.

Lower Hudson Valley Section N.Y.S.S.W.A.

Another meeting in the process of organizing a Lower Hudson Valley Section of the New York State Sew. Works Assn. was held Sept. 11 at Yonkers, N. Y. Prior to the meeting, an inspection trip was made of the Ossining, N. Y. Sewage Treatment Plant and of the North Yonkers Sewage Screening Plant operated by the Westchester County Dept. of Public Works. Dinner was held at the Habirshaw Athletic Club in Yonkers.

The meeting was presided over by Temporary Chairman, A. E. Kassay, Sup't. of Sewage Treatment of North Tarrytown, N. Y. More than 100 persons attended. The meeting was welcomed by James C. Harding, Commissioner of Public Works, Westchester County.

A paper on "Sludge Digestion, A New Approach" was presented by T. M. Riddick, Consulting Sanitary Engineer, New York City. Mr. Riddick told of the use and beneficial effects of ammonia as an alkali to raise the pH of solids sludge digestion tanks. These tanks had been practically killed off by an industrial waste. The addition of ammonia had a beneficial effect not only in raising pH and alkalinity, but also in increasing the activity of the digesters. Mr. Riddick believes that the high rate of diffusion of ammonia in solution, as compared with other alkalis such as lime, is to be desired and the increase in nitrogen content also appears beneficial. The ammonia is added with a Wallace & Tiernan ammoniator.

Following the technical discussion, a round table discussion was held on the subject of forming a Lower Hudson Valley Section. A. F. Dappert, Secretary, N. Y. Sewage Works Assn. from Albany, spoke on the subject as did Ralph Sweeney, District Engr., State Health Dept., Middleton, who is acting as Temporary Secretary of the organization. Plans were formulated to petition the N. Y. State Sewage Works Assn. for the formation of a local section.

QUICK FREEZING OF SMALL PIPES FOR REPAIRS

By JOHN L. FORD*

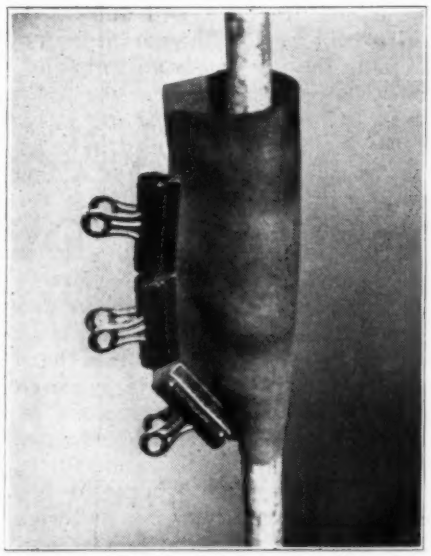
WHEN curb valves on water services have to be replaced or when street widening makes it necessary to lengthen the service to the curb valve, it is a big advantage to be able to shut off the pressure.

Shutting off the corporation cock at the main generally involves too much digging and expense to be practical unless it is the only way. Some water works men use an expanding rubber plug on a rod which is pushed through the open curb valve and then expanded to stop the flow, but some valves have a narrow water passage which will not pass a rubber plug large enough and in some cases it may be desirable or necessary to stop the flow ahead of the valve without disconnecting the piping at the valve outlet. A rubber plug is useless when service pipe is being lengthened as the plug cannot be taken out.

In some water works it has been common practice for many years to temporarily freeze water in pipes to serve as a plug in the line and prevent flow during valve changing or other repair and extension work. I recall my father telling how he used a box about 4 in. square and a foot long with notches in the end to slip under service pipes and then fill with ice and salt. The principal requirement for service pipe freezing is stopping the flow during the process, or at least cutting it down to a rate which will permit freezing. In replacing defective curb valves it is generally possible to cut the flow down far enough.

Considering the simplicity and ease of service pipe freezing it has always been surprising that it is not used oftener. Maybe it never received enough publicity.

The use of dry ice (solid carbon dioxide) for pipe freezing probably dates from the time when this material first became available. Its principal advantage is that it is so cold that it works amazingly fast. Also it is clean to handle and is now easily obtainable from almost any frozen vegetable distributor or ice cream shipper.



Suggested Arrangement for Freezing Vertical Pipe

(To make liquid tight joint around pipe press clay, chewing gum or wax into corner between pipe and bottom clamp.)

Simple Method of Freezing Service Lines

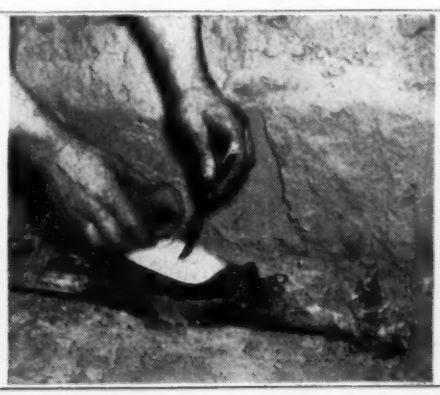
Recently I have been doing a little experimenting to find the best and quickest way to freeze water in pipes with dry ice and have worked out the following procedure which is certainly simple and fast. A piece of old inner tube about 8 in. by 10 in. is centered under the pipe and then brought up and fastened together with wide and strong paper clamps. The rubber should not be stretched tight from end to end but should be a little loose so as to form a pocket around the pipe—see cut.

For freezing a ¾ in. pipe a piece of dry ice about as big as a tennis ball and weighing about one pound is ample. This is placed in a cloth and then pounded into "snow" with a hammer, board or stone. The "snow" is then poured into the rubber pocket and about one-fourth pint of alcohol is poured in on top, the two ingredients making a wet mush which is so cold and makes such good contact with the pipe that the water inside is quickly frozen. Any alcohol, anti-freeze or even rubbing alcohol can be used. Gasoline or naphtha are also satisfactory though these may be hard on the rubber. However, old tire tubes can be had for the asking at most service stations so the cost of the rubber makes no difference and gasoline may be more readily available than alcohol.

When the flow in the pipe can be stopped entirely this procedure will freeze the water in a ¾ in. steel pipe solid in from two to five minutes. With a flow of 1/30 gpm. (about

*Secy. & Treas., The Ford Meter Box Co., Wabash, Ind.

(1) *After pounding dry-ice into "snow" in a cloth, pour it into rubber pocket around pipe.*



(2) *Pour about one-fourth pint of alcohol or gasoline on the "snow" and stir to mix thoroughly.*

(3) *After 3 to 5 minutes the water in pipe is frozen solid. The cock or valve can now be slowly opened to check for flow stoppage and then removed.*

one-fourth pint per minute) the flow will stop in about the same time. This flow is more than a drip, coming out of a smooth ended small faucet or small pipe as a steady stream about 1/16 in. in diameter and breaking into drops some three inches below. The experiments on which these results were observed were made with water of about 65° F.; colder water would freeze a little faster. It takes several times as long to freeze a service with dry ice when no liquid is added. Apparently this is because the liquid makes better contact with the pipe and conducts the heat away faster.

In actual work in the trench there may be a small drip from the valve which can be watched to see when the flow stops to indicate that the pipe is frozen. An interesting phenomenon is the fact that after the pipe is frozen solid at one point the drip or leak will increase noticeably for several seconds. This is caused by the expansion of the water as it freezes on the outlet side of the ice plug. Until the ice plug becomes solid the expansion from freezing is forced back toward the main.

When there is no leak or drip to watch, the best procedure is to leave the valve closed for five minutes after the dry ice and liquid are poured around the pipe and then open the valve cautiously, keeping in mind that there will be a small amount of water under pressure between the ice plug and the valve which may deceive the operator into thinking the ice plug is not yet solid. If the flow continues, close the valve again before the water thaws much of the ice that has formed, and let the freezing action continue a few minutes longer and again try for flow.

After the pipe is frozen solid it will remain so as long as there is any dry ice left in the envelope and more can be added if desired. After the necessary piping changes have been made the rubber is removed and warm water can be poured on the pipe to thaw it, or a torch can be used. The rubber can be re-used many times and the expense of this method is only 15 cents for material. The time required is only a few minutes in most cases. There is no damage to any kind of pipe by this process, but of course dry ice should never be handled with the naked hand.

If the flow cannot be reduced to about half a pint per minute the pipe cannot be frozen as mentioned above because the warm water passing through keeps a small opening melted through the ice. A longer pocket providing more contact would doubtless freeze a greater flow but it is obviously impossible to stop large flows unless means are available to reduce the leak to a rate that will freeze within a reasonable time.

A Warning

A word of warning should be added about the use of dry ice. The carbon dioxide given off is not poisonous but it can cause suffocation and even death. The small amount used in pipe freezing and the natural ventilation available makes the danger in this work almost negligible. There is little fire hazard with alcohol or gasoline during the freezing because the concentration of carbon dioxide and the low temperature of the liquid prevent ignition.

Atlanta to Pump Water With Garbage

$1,000,000 Incineration Plant to Supply Steam

Atlanta, Ga. is planning the construction of a garbage and rubbish incinerator at its raw-water River Pumping Station. The purpose thereof is the supplying of steam from the incineration plant to operate the low lift water pumps.

The Atlanta authorities have reached the decision to convert 300 tons per day of garbage and rubbish into power for pump operation largely as the result of the success of another Atlanta incinerator which produces steam that has been sold to the Georgia Power Company for approximately $65,000 per year for the past few years.

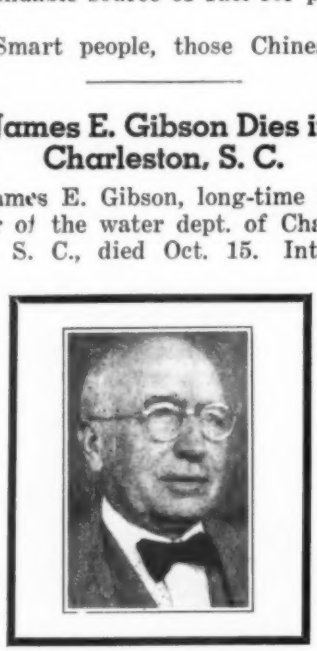
The proposed River Pumping Station incinerator will cost $1,000,000 but is expected to save the Atlanta Water Works about $35,000 per year in fuel costs for water pumping. In addition the installation will serve in the place of a $325,000 boiler installation needed at the River Pumping Station. It also will preclude the necessity of installing another down-town incinerator at $325,000 estimated cost.

The new incinerator-boiler station is to be financed through the sale of revenue bonds by the Water Department. This inasmuch as the incinerator will become an adjunct of the water works, insuring a steady and dependable source of fuel for pumping.

"Smart people, those Chinese!"

James E. Gibson Dies in Charleston, S. C.

James E. Gibson, long-time manager of the water dept. of Charleston, S. C., died Oct. 15. Into 73



years Mr. Gibson packed an amazing amount of engineering accomplishment and service to the water works industry and his community.

Among other things, Mr. Gibson is best known for his pioneering work with the Amer. C. I. Pipe Co. on the manufacture of cement lined cast iron pipe which was introduced in Charleston in 1922. He also pioneered the lining of C. I. pipe in place by the Tate Lining Method and wrote about this work in *Water Works and Sewerage* in 1939.

A graduate of the Univ. of Arkansas as a Mech. Engr., Mr. Gibson began his career as an asst. engr. with Jay M. Whitham, Cons. Engr., Philadelphia. From 1897 to 1917 Gibson was principal asst. engr. to John W. Ledoux, Chief Engr. of the Amer. Pipe and Const. Co., Philadelphia. This company manufactured a cement lined wrought sheet iron pipe for water lines and constructed and financed water works, electric plants, etc., including the Charleston Water, Light and Power Co. In 1917 during purchase negotiations for those utilities between the company and that city, Mr. Gibson managed the properties. After the purchase, Mr. Gibson was asked to stay as manager of the water department.

Mr. Gibson prepared numerous technical papers and served on committees for the A.S.C.E., A.S.S.M.E., A.W.W.A., and N.E.W.W.A. He was trustee, director, vice pres. and president (1928) of A.W.W.A., as well as president of the So. Car. Soc. of Engrs. and the Charleston Rotary Club. Mr. Gibson received the A.W.W.A. Diven Medal in 1929 and A.W.W.A. Honorary Membership in 1940. The Univ. of Arkansas awarded him an Honorary Degree of Doctor of Science in 1941.

OPERATION OF SMALL FILTRATION PLANTS

III. Coagulants and Feeding

(The Third of a Series)

by
A. E. CLARK
General Manager
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NASHVILLE, TENN.

ONE condition for the production of a properly settled water is correct coagulant dosage. If the amount of coagulant fed into the raw water is not closely controlled, very little dependence can be placed on the results due to over or underdosing, either of which would give somewhat similar results. Proper dosage is obtained by good feeding equipment.

The type of feeding equipment depends on the coagulant used. Two are in general use—solution feed and dry feed. Solution feed equipment was first used, followed by the development of dry feed machines, which are now used almost exclusively if the coagulant lends itself to this method.

Solution Feed

In general, solution feed equipment consists of combined dissolving and storage tanks, constant level orifice box and adjustable orifice. When used for solution feed, the alum is usually received in lump form. The total volume of the dissolving and storage tanks being known as well as the volume per inch of depth of tank, the solution is made up of a known strength.

A simple chart is provided showing the number of pounds of chemical to be put into the dissolving rack for a known depth of tank to be filled. The dissolving rack should be provided with a screen to keep out of the solution tank any foreign material which might clog small valves. The storage tanks should be provided with drains for periodic cleaning and well painted on the inside with acid resisting paint for alum and ferrous sulfate solutions. After the coagulant is dissolved it is stirred either by hand or mechanically to be sure that the solution is homogeneous.

This solution when ready to use flows into a constant level box where the level is maintained by means of a float valve. The solution either flows by gravity from the constant level box or is pumped to the point

The Author

of application. The quantity leaving the box is measured by means of a calibrated variable orifice. The orifice opening depends on the coagulant dosage and quantity of water to be treated. When application is made to a uniform supply of raw water, manual operation is satisfactory, but if the quantity of water to be treated is variable, then it is necessary to have automatic feed. This can be done by suitable connections to a meter on the raw water supply, whereby any variation in the meter will make a proportionate variation in the coagulant feed. Solution feed equipment requires quite a bit of space and consumes considerable of the operator's time. As stated above, it is still necessary to use solution feed with some coagulants.

Dry Feed

The use of dry feed equipment is especially helpful for feeding aluminum sulfate, lime and soda ash, as well as ferric sulfate if the dry feed machine is suitable. Most of the other coagulants are fed in solution form. There are two types of dry feed machines, volumetric and gravimetric. This former type of equipment measures definite volumes of the chemical which is usually dissolved before reaching the point of application. Beneath the measuring mechanism there is a dissolving tank into which the chemical falls and into which there is a constant quantity of water flowing with suitable baffles to provide solution of the chemical before leaving the tank. These machines are equipped with different size hoppers, depending on the quantity of chemical used per day. The hoppers can extend up through the storage room floor for ease in handling the chemicals when filling.

If alum is used, the solution tank is usually lined with lead. A leak may show up in the lining and if it does it should be repaired immediately because alum solution is corrosive to the outside metal. Due to the dampness or splashing of water on the feeding mechanism it will become corroded. These parts should be thoroughly cleaned at regular intervals and painted with an acid resisting paint.

If hydrated lime is being used, an agitator is provided in the solution tank, but even though the lime is kept fairly well in suspension, there will be a deposition of lime on the bottom and sides of the tank. This should be cleaned off at regular intervals and the tanks painted if necessary. The same precaution applies to the feeding mechanism. An agitator is also provided in the storage hopper. Lime has a tendency to arch and if this should occur the operator might have a quantity of lime to clean up. It is well to check the lime frequently in the hopper and if it has a tendency to arch, poke it down with a stick or change the agitator so that it will prevent arching.

The life of dry feed equipment depends on its maintenance. If allowed to operate without oiling, greasing, cleaning, painting and repairing when necessary, the upkeep is high. If properly maintained, the upkeep is very low.

The same precautions apply to the gravimetric equipment. Adjustment of the amount of chemical to be fed depends on the opening of the measuring device or by a variation in the speed or a combination of the two. Manual feed is satisfactory if there is a uniform flow of raw water, but if the flow is variable, then it is necessary that automatic equipment be provided. This can connect with

the raw water meter and for each change in the meter a corresponding change is made in the speed of the dry feed mechanism.

Quantity of Chemicals

When using solution feed, charts and tables are made up so that the operator can make up the solution of chemical to the desired strength and feed it in the desired quantity. It is necessary to calibrate the orifice periodically so that if there is any variation it will be corrected.

When using dry feed equipment it is also necessary to provide charts and tables for the use of the operator. The dry feed machines may be calibrated for varying feeds and a chart made up so that for any opening or speed the quantity of chemical fed will be known. Then referring to a table, the operator can find the quantity of chemical required for any dosage and quantity of water to be treated. Then he need only refer to the calibration chart and set the feed of the machine to give the quantity of chemical for the given flow of water. The calibration is satisfactory for any given shipment of chemical. If recalibrated on another shipment, there may be changes due to variation of the fineness of the chemical. The author has found that actual weighing of the quantity of chemical fed by the machine for a definite period of time, say ½ to 1 minute, to be much more accurate. A table should be provided showing the quantity which the machine should deliver for a given dosage in a given time. Unless there is a change of dosage, one or two checks per day are sufficient, but it is necessary to check weights each time the dosage is changed. The scales used for this purpose should be accurate, weighing a maximum of say 20 pounds; for small plants up to 10 pounds would be large enough. They should weigh accurately to quarter ounces. The scales themselves should be checked for accuracy at periodic intervals.

Coagulants

As stated in a previous article, aluminum sulfate is the most widely used coagulant. It is made from sulfuric acid and bauxite and contains about 17 per cent aluminum oxide. When reacting with a water containing sufficient natural alkalinity, the floc $Al(OH)_3$ is formed, as well as $CaSO_4$, calcium sulfate (hardness), and CO_2, carbon dioxide. For the reaction the aluminum sulfate requires 7.7 ppm. of alkalinity for each grain of alum. When there is not sufficient alkalinity present in the water it is necessary to add it, usually by using hydrated lime $Ca(OH)_2$ or soda ash Na_2CO_3.

Ferrous sulfate is used in conjunction with lime. In order to form a floc the ferrous iron is oxidized to the ferric state. Lime is used to produce ferrous hydroxide, which is oxidized by oxygen in the water to the ferric state; the final floc consists of $Fe(OH)_3$, ferric hydroxide.

These are the most generally used coagulants, although ferric sulfate, ferric chloride, sodium aluminate in conjunction with aluminum sulfate and the silica sols are being used more than formerly. At times a condition will exist which will yield readily to one of the above, whereas aluminum sulfate will fail to produce the desired results. The coagulant to be used will depend on the quality of the raw water and economy.

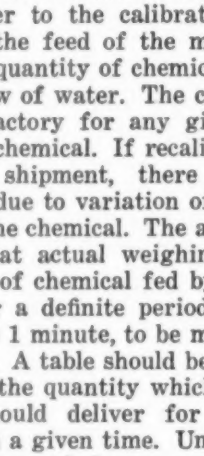
The Jar Test

The simplest and quickest test to check the correctness of the coagulant dosage is the pH test. In using the jar test for the proper coagulant dosage varying quantities of the standard coagulant solution are added to the jars containing uniform quantities of the raw water. After stirring and settling, the jar giving the best results will represent the dosage to be used. As an example, assume that the water in the jar showing the best coagulation has a pH of 7.2. Then all that is necessary to check the dosage is to collect a sample of the treated water from the mixing chamber at a point after the floc is formed and check the pH of this sample. If the pH is above 7.2 it indicates that insufficient coagulant is being added, and conversely, if the pH is below 7.2 it indicates that too much coagulant is being added. The adjustment of the feed can be made either way to correct the dosage.

If a difficult coagulation problem is encountered it is well to contact the State Sanitary Engineer and ask him to assist or advise in the correction of the problem. If troubles arise when alum is being used, it might be that another type of coagulant would solve the difficulty. There is no empirical rule which will apply to all waters. Each is a separate condition and must be worked out for its particular needs.

Ray F. Goudey Joins Truesdail Laboratories

Ray L. Derby Replaces Him in Los Angeles Water Dept.



According to an announcement from Dr. Roger Truesdail, Pres. of Truesdail Laboratories, Inc., Ray F. Goudey has been appointed to direct the activities of their new Sanitary Engineering Division.

About the same time, Laurence E. Goit, Chief Engineer of the Los Angeles Water Works Dept., announced that Ray L. Derby will fill the position of Sanitary Engineer of the Los Angeles Water Dept. to replace Mr. Goudey, who resigned in July.

Goudey, who is a graduate of Mass. Institute of Tech. and of the University of Southern California, had served as Sanitary Engineer of the Los Angeles Water Dept. for 17 years and prior to that time was an engineer on the staff of the State of California for 13 years. Goudey's professional activities have been well known in the A.W.W.A. and the A.S.C.E., both of which he has served in elected capacities and for which he has written many technical articles.

Under Mr. Goudey's direction the Truesdail Labs. will extend their services to include design, reviews and research involving conservation, investigations, treatment and protection of water quality used for domestic, industrial, and agricultural purposes, as well as reclamation, treatment and disposal of sewage and industrial wastes.

Mr. Derby, who replaces Mr. Goudey as San. Engr. in the Los Angeles Water Dept., is a graduate of the University of California in 1922. His experience includes working for consulting engineering firms and the State Dept. of Health.

Mr. Derby joined the Water and Power Dept. of Los Angeles in 1933 as a water chemist and the following year was promoted to assistant sanitary engineer. From 1941 to '44 Derby served as a major on Coast Artillery.

16th ANNUAL GEORGIA WATER AND SEWAGE SCHOOL*

MEETING once again in the halls of the Chemistry Building of famed Georgia Tech in Atlanta, the Georgia Water and Sewage Assn. held its 16th annual school on Sept. 17-19. This school, which attracted more than 300 registrants this year is conducted jointly by the Ga. Water and Sewage Assn., Georgia Tech. and the Ga. Dept. of Health.

Presidents

Incoming
B. L. Coburn
Supt. Water
Fitzgerald, Ga.

Outgoing
Comer Turley
Mech. Supt
Pepperell Mills
Lindale, Ga.

As in the past, water meter maintenance instruction was given under the direction of **W. H. Kelly,** Supt., Meter Dept. of the Atlanta Water Works. Manufacturers of chlorinators and of filter control equipment demonstrated proper maintenance and operation of these pieces of apparatus.

Attendees at the water and sewage school were welcomed by **Col. Blake R. Van Leer,** Pres. of Georgia Tech., who told of the expansion of facilities of the graduate school of the College. There is now being offered the master's degree in sanitary engineering and plans are underway to establish a Technical Institute for the training of technologists or technicians for varied industries. It is expected that one or two years of instruction may also be developed to train water and sewage works operators. This idea is by far the most forward looking plan for the future of water and sewage plant operation. It is to be hoped that the plan will be developed, and if so Georgia will certainly lead the way towards the goal of all water and sewage works superintendents, namely, a staff of well trained operators.

*Approximately half of this report was prepared by Harry A. Faber, Editorial Associate, *Water & Sewage Works*, and Research Chemist, The Chlorine Institute, New York City.

New Officers and Awards at Annual Banquet

At the annual banquet held at the end of the school, new officers were elected for the ensuing year. The banquet was given to the registrants with the compliments of the Southern States Chemical Co. of Atlanta, and was presided over by **Comer Turley,** Pres. of the Assn. and Mechanical Supt. of the Pepperell Mfg. Co. Lindale, Ga. The new officers of the Georgia Water & Sew. Assn. are:

President

B. L. Coburn, Supt. of Water
Fitzgerald, Ga.

First Vice President

D. H. Hurst, Supt. of Water
Tifton, Ga.

Second Vice President

Clyde Angle, Water Supt.
Celanese Corp.
Rome, Ga.

Kenneth Allen Award
G. R. Frith, Engr., Georgia State Dept. of Public Health, receives 1947 award from F. S. Friel, President, Fed. S.W.A.

Secy.-Treas.

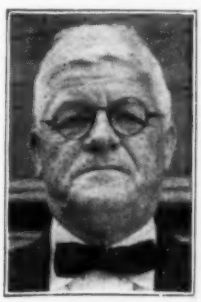
Van P. Enloe, Supt.
R. M. Clayton Sew. Tr. Plant
Atlanta, Ga.

L. E. Waller of Atlanta was elected Assoc. Secy.-Treas., and Paul Killian, of Brunswick, Ga., was elected director from the sixth district, while L. E. Wallis, Elberton, Ga., was elected director from the second district.

Two annual awards were made: The Frederick J. MacMullin Memorial Award to a water plant operator and The William A. Hansell Award to a sewage works operator. The citation for the first of these awards read, "The efficient and safe operation of a water purification plant makes possible the supplying of one of the most essential basic public health requirements in a community. Faithful conformance to the highest principle of public service is the foundation upon which rests the merited confidence of those who enjoy the continuous protection of public water supply facilities. To one who for a long period has performed these services with a fidelity and efficiency of a high order, the Georgia Water and Sewage Association makes its 1947 Frederick J. MacMullin Memorial Award to **W. C. Hartman,** Supt. of Filt., Water Dept., Milledgeville, Ga.

The citation of the second annual award read, "The investment of a considerable portion of the public wealth of a municipality in modern sewage and industrial waste treatment facilities is tangible evidence of an advanced state of the necessity of capable maintenance of physical equipment, and adequate control of treatment processes is further proof of the intention to meet fully the obligations inherent in the society of municipalities. When the physical and human factors are joined into an harmonious whole, the aim of that branch of sanitary science embracing sewage treatment attains its highest objective.

"In the recognition of the faithful attention to the many details involved in sewage treatment plant maintenance and the accomplishment of highly successful treatment results with a difficult mixture of sewage and industrial wastes, the Georgia Water and Sewage Assn. makes its 1947 William A. Hansell Memorial Award to **M. B. Price,** Supt. of Sewage Treatment, Thomasville, Ga."



Secy-Treas.
V. P. Enloe
Supt. Sew. Tr.
Atlanta, Ga.
(Re-elected)

Awardee
W. C. Hartman
Supt. Water
Milledgeville, Ga.
(MacMullin Award)

(The Hansell Award went to M. B. Price, Supt., Sewage Treatment, Thomasville, Ga.—the photographer missed him.)

Public Relations

Following the banquet and presentation of awards, George E. (Doc) Symons, Assoc. Ed. of *Water & Sewage Works* gave his now famous after dinner speech titled, "How Are Your Relations—Public, That Is!"

Vice Presidents

D. H. Hurst
Supt. Water
Tifton, Ga.

Clyde Angle
Water Supt.
Celanese Corp.
Rome, Ga.

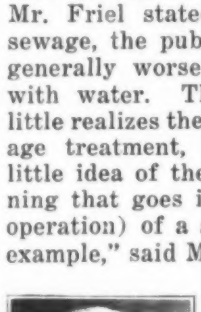
Responsibilities of Operators

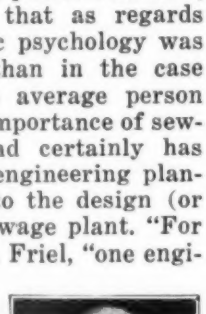
The lecturers, many from out of the state, were for the most part introduced by **W. H. Weir,** Public Health Engineer of the Georgia State Dept. of Health. Mr. Weir who was responsible for scheduling most of the speakers, has long been an important sparkplug in the Georgia Water and Sewage School. It was he, who with his staff, guided the question and answer periods after each lecture, as well as sharing with Van Porter Enloe, Secy. of the Assn., the introduction of the speakers. The first speaker of the school was **Francis S. Friel,** Cons. Engr., Philadelphia. Mr. Friel, who said that he was making his last appearance as President of the Federation of Sewage Works Assns., spoke on the "Responsibilities of Water and Sewage Plant Operators," and said that the problems of water and sewage treatment are definitely inter-related. In a country which is rapidly becoming stream pollution conscious, it is important to train water and sewage works operators. Georgia is one of fifteen states having short schools, and the voluntary certification plan in Georgia is a commendable step according to Mr. Friel.

In the field of public health, of which water and sewage treatment is so important a part, operators have manifold responsibilities according to Mr. Friel, who pointed out that the control of plant operation must rest with the operator. The automatic plant that will perform properly without an operator has not been built. Operators, who are generally underpaid, have responsibilities to the employer (the public), to the governing body, and to themselves as professional people.

Expanding these three basic concepts of responsibility, **Mr. Friel** emphasized the responsibility of the water operator to produce a safe palatable water supply, and the sewage works operator to turn out a harmless effluent. In both cases it is up to the operator to produce the maximum results with the equipment available, which means carrying on proper and protective maintenance, as well as determining the needs for new equipment.

In the matter of public relations, Mr. Friel stated that as regards sewage, the public psychology was generally worse than in the case with water. The average person little realizes the importance of sewage treatment, and certainly has little idea of the engineering planning that goes into the design (or operation) of a sewage plant. "For example," said Mr. Friel, "one engineer can design a $100,000 mill building in a month, but because of the complexity involved it takes four engineers working for two months to design a $100,000 sewage treatment plant."





Lecturers!

Operator Responsibility
F. S. Friel
Cons. Engr.
Philadelphia
(Pres., F.S.W.A.)

Water Chemistry
A. P. Black
Prof. of Chem.
Univ. of Fla.
Gainesville, Fla.

Good public relations need good publicity, but mostly they need good person to person contact. Inasmuch as both water and sewage works affect public as well as private life, the operator must make the effort to create good will for his job. He must do his job well, make a special effort to be courteous to the public, and participate in civic activities as well as obtain good publicity.

In carrying out one's responsibilities to his employers, an operator must have loyalty to the administration of the city government, but should not exercise any political pressure to obtain needed equipment, maintenance, supplies, or personnel.

Professionally, water and sewage operators have a responsibility to keep informed of progress in the fields, and to advise designing engineers of advantages or disadvantages of any particular design of plant or equipment.

Kenneth Allen Award

In closing his talk, Mr. Friel, as president of the Federation, presented the Federation's Kenneth Allen Memorial Award for the Georgia Water and Sewage Assn. to **Gilbert Frith,** of the Georgia Dept. of Public Health, for his services to the association.

Financing Facilities in Georgia

The topic, "Financing Water and Sewage Facilities" as presented by **Sumter Kelley,** Attorney of Atlanta, explained the Georgia laws which govern Revenue Certificate Financing in that state. This system, commonly called revenue bonds in other states, is relatively new in Georgia, and has only recently been applied to both water and sewage facilities. Heretofore, the use of these certificates in Georgia has been for water works only, and even now it appears that the trend is to increase water rates under the revenue certificate system without saying anything about sewage plant operation, although the increased income is to be used for sewage treatment purposes.

Mr. Kelley said that the project must be self-liquidating, although it might have a life of thirty years, but that the plan should make provision for all eventualities including variations in business cycles. Whatever the plan, it is important that a good engineering survey precede its adoption and that it not be overdone in the beginning.

Among other comments made by the speaker was one to the effect that revenue bonds are not eligible for trust funds in Georgia. If they

More Lecturers!!

Chlorine
Harry Faber
Res. Chemist
Chlorine Inst.
New York City

Pumps
Thos. Lowe
Dir. Civ. Engr.
Ala. Poly. Inst.
Auburn, Ala.

were it would reduce the interest rate on the bonds. Also, to interest buyers, a good set of records showing the ratio of cost of operation and maintenance to revenue are helpful. Ordinances setting up revenue bonds should stipulate the records of operation to be kept.

And More Lecturers!!!

Sludge Digestion	Treatment Process
R. E. Fuhrman	*Geo. E. Symons**
Supt. Sew. Tr.	*Assoc. Editor*
Washington, D. C.	*Water & Sewage Works, N. Y. C.*

*(*Doc also was the banquet speaker on Public Relations)*

Water Treatment Chemistry

Dr. A. P. Black, Professor of Chemistry, University of Florida, Gainesville, Fla., lectured on the chemistry of coagulation and water softening. After defining coagulation, Prof. Black explained the reactions involved in the precipitation of colloids, the types of colloids involved, and what takes place during the coagulation. Colloids, being very finely divided solids, carry electrical charges which can be neutralized by the electrical charge on the ions of coagulants, as for example aluminum and/or iron ions. In addition to the flocculation of these colloids by the neutralization of the electrical charge, there is precipitation by chemical adsorption.

Coagulants used include the well known filter alum, which is aluminum sulfate with molecules of water of crystallization included, and iron sulfate, either in the ferric or in the ferrous state, in which case oxygen is required to complete the reaction. In Florida, activated silica has been found effective as an aid to coagulation. Analytical control in coagulation includes jar tests, determinations of color, turbidity, pH, and alkalinity.

On the subject of water softening, Prof. Black pointed out that there is both carbonate and non-carbonate hardness and that hardness is caused by the presence of dissolved salts of calcium and magnesium. Then Dr. Black showed the reactions that take place in softening, how lime reacts with dissolved carbon dioxide, and then with the calcium and magnesium salts. The extent to which softening can be accomplished depends on the limits of solubility of calcium carbonate and magnesium hydroxide under different conditions. Best results are obtained in the sludge reactor type of softening equipment.

Elevated Tank Maintenance

The "Preservation of Elevated Tanks" was discussed by **Charles J. Leary,** Pres. of the Leary Construction Co. of Atlanta. Mr. Leary spoke from long experience in the maintenance of tanks.

Water tanks should last indefinitely, if protected and maintained, according to Mr. Leary, who said that the first requisite was to keep the footings and foundations in good shape. Windage or sway rods should be kept tight to prevent tanks from twisting and developing leaks. Riser pipes should also be kept tight, and the expansion joint at the bottom kept in good condition. Cat-walks are not just to walk on, they act as stiffening, but will rust out if drainage is not proper.

Too often, the underside of the roof does not get attention. Side walls are subject to corrosion, pitting, both from galvanic action and from rusting due to air oxidation in moist condition. Spider rods may not serve as a help for the tank rigidity, but they do serve as places for boards and rigging for the repair man, and should be replaced when rusted out. Operators should bring the condition of an elevated tank to the city council or governing body whenever it needs attention.

Two Professors

Thos. M. Lowe, Ala. Poly. Inst.
H. A. Wyckoff, Georgia Inst. Tech.

Corrective action or maintenance should include painting inside and out every five years; but inspection every year. Paint will last longer in the southern states than in the more severe weather of the north. It pays to hire a good inspector; representatives of tank manufacturers will tell what a tank needs. Things to remember, according to Mr. Leary, are that all paints are not good in all waters. The best paint for a particular water should be determined by experiment. Cathodic protection has worked well when properly installed and operated, but its application should be carefully studied before installation. When tanks are cleaned, repaired, or painted, they should be sterilized with strong solutions of hypochlorite before being placed in operation again.

Pump Maintenance and Operation

Professor **Thomas M. Lowe,** Director, Dept. of Civil Engr., Ala-

"Bill" Weir—and Staff

Wm. H. Weir
Pub. Health Engr.
Ga. Dept. of Public Health

Wm. Averette
Engineer

Technicians and Office Staff

Elizabeth McEntire, Dorothy Smith, Mildred Jeffries, Sue Breen, Mrs. Cecil Malone, Elsie Westerman

(G. R. Frith, Kenneth Allen Awardee, not shown here)

N. M. de Jarnette
Chemist

Elsie Westerman
Secy. to Bill Weir

bama Polytechnic Institute, Auburn, Ala., said that in the matter of care and operation of pumps, selection and installation were most important. If pumps are not selected and installed correctly, they cannot operate correctly. Before selecting a pump, the designer should be consulted; it is not possible to tell from the outside or size of a pump, what it will do.

School Days
Session Ready to Start; Between Classes; Dr. Black Lecturing

Watching gages and records will indicate to the observer whether or not a pump is going to give trouble. Prof. Lowe recommends that tools for servicing pumps be kept nearby, and that all pumps should have a hoist hook handy. A complete parts list is desirable and the operator should stock replacement parts that are most likely to be needed.

Indicators of trouble are to be found in the sound and temperature of a pump. Any change in sound or the occurrence of heating presages trouble. Ninety per cent of the troubles occur on the suction side of the pump. Where possible, use a positive head on the suction side to minimize trouble. Suction lines should be short and should slope upward to the pump. Avoid the development of pockets of air in suction lines. Use eccentric reducers to prevent air pockets.

While a pump can carry three to four per cent air, more than that impairs efficiency and output. Suction lines should have bell entrances which should not be placed too close to the floor of the suction well. These were a few of the pointers given to the school by Prof. Lowe.

Sewage Treatment Processes

On the subject of "Sewage Treatment Processes and Their Results" **George E. (Doc) Symons,** Assoc. Editor, *Water & Sewage Works,* New York City, stated that there are but three processes of sewage treatment; primary treatment, secondary treatment, and disinfection. Solids disposal is a by-product process to the first two. Primary treatment consist of the mechanical or physical removal of solid matter from the liquid sewage. Secondary treatment consists of wet burning or biological oxidation whether or not it takes place on trickling filters, in activated sludge tanks, or in contact aerators. Disinfection may be brought about by various chemicals but for the most part is accomplished by chlorine or hypochlorites. The first two of these treatment processes have a number of aids which improve the efficiency or effectiveness of the processes. Chemical precipitation is an aid to primary treatment, for example, while pre-aeration, distributed input, or step aeration are aids to the activated sludge process as is recirculation in the trickling filter. There are a number of mechanical aids or equipment which improve primary treatment as does design of equipment.

Solids disposal includes screenings, grit, and sludge from both primary and secondary treatment. Sludge may be disposed of by digestion and drying, or by incineration. Dewatering of sludge before drying is a part of the process.

Each of these processes has certain expected results and each of the aids improves that normal result by a certain amount. The average expected results from each of these treatments and its various aids was discussed by Dr. Symons.

Chlorination of Water and Sewage

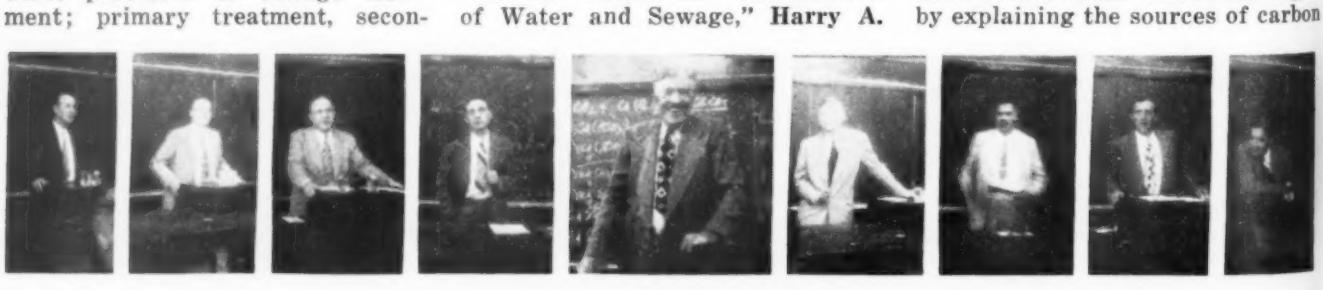
In his lecture on "Chlorination of Water and Sewage," **Harry A. Faber,** Research Chemist of the Chlorine Institute, Inc., New York City, reviewed the principles involved in the processes. Mr. Faber did this by supplying the answers to three questions: (1) Why are water and sewage chlorinated?, (2) what is accomplished by water and sewage chlorination?, and (3) how is water and sewage chlorination controlled?

In discussing the reasons for chlorinating water and sewage, it was pointed out that the first and most important reason for chlorination is to kill pathogenic bacteria. As secondary uses, the special applications of chlorination for the improvement of other water and sewage treatment practices were described.

The terminology of chlorination, the effect of chlorine on micro-organisms, and the chemical reactions of chlorine were reviewed in order to explain what is accomplished by chlorinating water and sewage. In the control of chlorination, chlorine dose, chlorine demand, and contact period were discussed. The measurement of residual chlorine was emphasized, and the ortho-tolidine-arsenite (O-T-A) test to distinguish between combined and free residual chlorine was demonstrated. Because this test procedure provides a simple and accurate means of difficulties due to the presence of interfering substances in chlorinated water, it should be used wherever this problem is encountered.

Corrosion Control

In a highly instructive manner, **Dr. A. P. Black,** Prof. of Chemistry, University of Florida, Gainesville, Fla., reviewed the background of "Corrosion Control" and the problems of corrosion. Dr. Black began by explaining the sources of carbon



Behind The Lecture Table
Comer Turley, Pres. Ga. W. & S. Assn.; Col. B. R. Van Leer, Pres. Ga. Tech.; F. S. Friel, Pres. Fed. Sew. Works Assns.; R. E. Fuhrman, Supt. Sew. Tr., Washington, D. C.; A. P. Black, Prof. of Chem., Univ. of Fla. (Doc Black is a big man wherever he lectures); Wm. H. Weir, Pub. Health Engr., Ga. Dept. of Health; J. H. Bauer, Engr., Robert & Co., Atlanta; Chas. J. Leary, Leary Const. Co., Atlanta; and Sumter Kelley, Attorney, Atlanta.

Field Trip To DeKalb County Water Works

(1) Host W. H. (Buck) Weaver sees (2) the 61-car caravan, (3) greets the visitors, (4) takes them inside (5) to see a filter washed, and (6) out again to see the coagulating and settling basins.

dioxide (naturally present in raw waters, and from the reaction of alum with alkalinity), and pointed out how the hydrogen ion of water acts on iron surfaces. Dr. Black illustrated graphically the three factors essential for corrosion to take place: A bare metal surface in contact with water, free hydrogen ions, and the presence of a depolarizer. It was shown that removal of dissolved oxygen will prevent tuberculation, but that it will not prevent corrosion.

Dr. Black explained that the reduction of nitrates to nitrites can be employed to remove hydrogen gas from water, and that similar removal can result from the combination of chlorine and hydrogen. Protective coatings and the adjustment of pH provide means for prevention of corrosion. In order to determine which waters will be corrosive or incrusting, it is necessary to know the temperature, total solid content, calcium ion, total alkalinity, and pH value. The Enslow stability indicator provides a ready means of evaluating the corrosive or incrusting characteristics of a water in plant operation without elaborate calculations.

Chemical treatment especially adapted to the prevention of corrosion includes the use of glassy phosphates (2 to 4 ppm.) or sodium silicate (4 to 8 ppm.). In closed systems, such as steam vaporizers with condensate return, certain amines have proved suitable for control of corrosion. Cathodic protection of water storage tanks is a successful method of corrosion prevention when properly installed and controlled.

Sight Seeing

V. Porter Enloe; Supt. R. M. Clayton. Sew. Treat. Plant, Atlanta; R. E. Fuhrman, Washington, D. C.; M. B. Nixon, Pub. Wks. Dept., Atlanta, Ga.

Field Trip

As a part of the school, a field inspection trip was taken to the filtration plant of the DeKalb County Water System and the pumping station of the Plantation Pipe Line Co. Sixty-one cars were included in the caravan.

Sewer Construction and Inspection

J. H. Bauer, Engineer of Robert and Co., of Atlanta, said that design of sewers included such items as length of sewer, joints of pipe, jointing materials, shoring and sheeting, depth of sewer, grade, etc. Another element in sewer construction is the open trench and bottom grade. A third element is the laying of the sewer. Mr. Bauer says not to lay pipe on a hard or unyielding surface. The load should be equally distributed over the bottom, which should be soft, with bell holes and so sloped that the entire barrel of the sewer takes the load.

If fill is necessary, it should be layered and compacted, or use concrete bedding and fill with dry concrete. When the load is properly distributed, the crushing strength is increased by 43 per cent over that where a three point load exists. Mr. Bauer also discussed the various types of bearings, and joints and jointing.

Inspection is important to see that the line is constructed properly. Just to look through a line is *not* inspection. Inspection must watch every joint and backfilling. Inspection must know the job from beginning to end.

Sludge Digestion

"Sewage Sludge Digestion" is the generally prevalent method of disposing of solids, according to **Ralph E. Fuhrman,** Supt., Dist. of Columbia, Sewage Treatment Plants, Washington, D. C. There are only 20 to 25 plants in the country that don't use this method of disposal. The process is not promoted as such by equipment manufacturers but certain types of equipment are promoted in connection with the use of the process as a means of sludge disposal.

The outstanding characteristic of the sludge digestion process is change; change in physical properties of the solids, change in volume, change in chemical composition. There is a shrinkage in volume and an actual loss or disappearance in solids, while at the same time the concentration of solids increases.

Mr. Fuhrman showed by diagram what happens to the volatile matter during digestion and explained the acid and alkaline phases of digestion. Fortunately both phases go on at the same time in a well operating digestion tank. Important factors in good operation are seeding, temperature, and reaction.

Mr. Fuhrman also discussed patents, circulation of supernatant, liquor, scum control, methods of heating, stage digestion, and the value of the gas. In the operation of digestion tanks, Mr. Fuhrman said, "it is worth remembering that the designer did some thinking in designing the plant and the operator should try to operate accordingly before starting to junk the system."

Sewage Treatment at Thomasville

M. E. Price, Supt. of Sewage Treatment, Thomasville, Ga., de-

Seen Around The Chem. Bldg.

Geo. Reid, Prof. of San. Engr., Georgia Inst. Tech.; Sherman Russell, Supt. Filt., Atlanta Water Works; Fred Stuart, Jr., student at Georgia Tech (a second edition of Stuart Corp., Baltimore).

Unscheduled Field Trip

Ralph Fuhrman, Washington, D. C., and "Doc" Symons, New York City, also saw (1) *and* (2) *The R. M. Clayton Sewage Treatment Works;* (3) *Stone Mountain;* (4) *observation glasses on water from various parts of Atlanta Water Works, and* (5) *Paul Weir's and Sherm Russell's corrosion experiments.*

scribed the difficult treatment problem encountered at his plant, where wastes from a meat packing plant and domestic sewage are handled together.

The combined wastes are treated by primary settling and by high rate filtration (which acts as a roughing filter and colloider), followed by intermediate settling and application to a standard rate filter, with final settling in a humus tank. A high removal of both suspended solids and B.O.D. is accomplished by this double filtration. A solids content of 300 ppm. and a B.O.D. of 600 ppm. in the raw waste may be reduced to less than 10 ppm. solids and the same amount of B.O.D. in the final effluent.

The treatment plant is designed for a domestic contributing population of 16,000 and for a packing waste load equivalent to 15,000 persons. When sewage is very dilute, a part of the flow may be applied directly to the standard rate filter from the primary settling unit.

Practical Sewage Plant Operation

In speaking on the subject of "Practical Sewage Plant Operation," **G. R. Frith,** Engineer, Georgia Dept. of Public Health, said that in general, good sewage plant operation will be indicated by good housekeeping.

Frith reviewed the operation of each unit in a sewage treatment plant, presenting useful information regarding maintenance and operating problems. For small plants, Imhoff tanks are in general use and have proven most economical to operate. Difficulties most frequently encountered in the maintenance of mechanically cleaned settling tanks are the provision of proper shearpins (to prevent destruction of sludge collecting mechanisms), and the proper control of sludge pumping (scum should be pumped ahead of sludge to prevent clogging of lines to digesters).

In digesters, control of scum has been most successfully accomplished by maintaining a temperature of 95 deg. F. Important factors in the operation of trickling filters were listed as: The maintenance of dosing tanks, pipes, and distributor mechanism in clean condition; the correction of ponding, best accomplished by preventive measures which included selection of stone (none smaller than 1.5 in.), and its careful placing by means of hand forks. If filters flood, caustic soda may be used for chemical treatment; drying or flooding of the filter beds may also accomplish the desired result. Control of filter flies has been found possible through the use of DDT, but only on the adult stage.

Procurement of Water in Georgia

In a symposium on the "Procurement of Water in Georgia," three practical and highly informative papers were presented to explain the varied problems of obtaining water from the surface and from underground in that state. A marked contrast exists between wells of the coastal plain area and that of the Piedmont plateau.

In discussing "Wells in the Coastal Plain," **W. S. Beiser,** Geologist, Layne-Atlantic Co., Savannah, Ga., described the definite formation of sand, clay, and limestone existing in that area.

The water content of either sand or clay is about 30 per cent of its volume, but screens are required and frequent clogging of the screens is encountered. Acidizing treatment has been used successfully for restoring capacity. Treatment with Calgon is a recent and advantageous method of increasing pumpage.

W. A. Martin, Manager, Virginia Supply and Well Co., Atlanta, explained that for "Wells in the Piedmont Plateau" cognizance must be taken of the red clay. Only red clay soil, in some instances as deep as 260 feet, exists down to the granite rock layers. There is no water available in this clay.

In order to obtain water from wells in this area, it is necessary to case the well through the clay into the rock (to prevent pollution and to provide a water-tight seal). Average depth of these wells is 400 to 500 feet. The life of the well is likely to be short, and the quality of water obtained may be poor.

The "Surface Streams" of the state were described by **M. T. Thompson,** Dist. Engr., U. S. Geol. Survey, Atlanta. Thompson reviewed the operations of the Geological Survey, which exists as a fact-finding and fact-publishing agency. Extremely useful data may be obtained from this agency for almost any stream providing useful quantities of water.

The speaker showed how a typical annual hydrograph of a river, indicates the minimum quantity of stream water available without the construction of a storage reservoir, and disclosed the periods as well as the extent of high water levels. Such a hydrograph would be of great value to indicate suitable locations for a filter plant.

Mr. Thompson stated that all evidence indicates that forested watersheds show less runoff than those which are bare; forestation, however, has a tremendous benefit in preventing silting of reservoirs.

Indiana Again Holds District Meetings

Water works personnel and members of the Indiana section of A.W.W.A. again took part in a series of district water works meetings held during the latter part of September and early October. The meetings were held in Valparaiso, Ft. Wayne, Greendale, Crane Naval Ammunition Depot, and Greencastle.

The program was set up to include a discussion of costs and prices in construction, elevated tank maintenance, talks by superintendents on production and distribution problems, comments by representatives from Purdue University, and a question box session.

FEDERATION BOARD OF CONTROL MEETS IN PHILADELPHIA

WITH retiring President **Francis R. Friel** acting as host, the Board of Control of the Federation of Sewage Works Assns. held its annual meeting in the Philadelphia Country Club. Mr. Friel, who has traveled many miles to many meetings during his stewardship of the Federation, turned the gavel over to **George S. Russell,** incoming president.

Secretary's Report

Exec. Secy. **W. H. Wisely** supplemented the 9-month report (made at San Francisco). The report stated that the A. W. W. A. and F. S. W. A. had both accepted the agreement covering publication of the 10th Edition of Standard Methods. Execution of the agreement awaits only the action by the A. P. H. A.

The standard methods research project has been placed in operation, one project is underway at M. I. T. and another at Wisconsin is awaiting final approval by the University.

Temporary membership privileges have been extended to two prospective new Member Associations, one in Brazil, and one in Louisiana. A request from the Swiss Water Assn. was referred to a committee for futher investigation.

Journal Costs

In September, the printing company that prints the *Sewage Works Journal* gave notice of a 13½ per cent over all increase in costs of printing and mailing the Journal, effective with the September issue. Because of the short notice, a compromise increase of 8 per cent was granted on the September issue, but the entire increase will be applied to the November issue and thereafter.

In spite of this increased cost of publishing the Journal, adding from $2100 to $2500 to annual printing costs, there will be no increase in dues or advertising rates for next year.

Membership

Each year two $100 prizes are awarded to the two associations showing the greatest growth in membership. One prize is for the greatest percentage gain, and the other for the greatest numerical gain in membership. This past year the Arkansas Association recorded the greatest percentage increase, marking up a gain of 725 per cent. This great gain was accomplished by the membership growing from four to thirty three. Second was Iowa with a percentage gain of 95 per cent.

The Institute of Sewage Purification in England showed the greatest numerical growth with a gain of 66 members. Runner-up for greatest numerical increase was the Michigan Assn. with a gain of 56. Four new member associations came in during the year, bringing in a new membership of 186. Total membership on Sept. 30, 1947 was 4159 but before Oct. 10, new member applications had brought the total membership to 4300. (It looks as though the Federation will meet the slogan suggested by *Water & Sewage Works,* to wit: "5500 by the 25th in '52").

Operation Reports Awards

The Board of Control accepted the report of the committee Operation Report Awards: The award in Class 1 (under 10,000) to Belvidere, Ill.; Award in Class 2 (10,000 and 100,000) to New Britain, Conn; Award in Class 3 (more than 100,000) to Minneapolis-St. Paul. Further consideration of the future of this competition was referred to the committee to decide on possible revisions in the basis of the competition.

Financial Report

Following the report of Mr. Wisely on the 1947 Budget which indicated that at the end of the year there would be an increse in net worth by $4085, the Board of Control considered the 1948 budget.

Chairman of the Finance Advisory Committee, **Wm. J. Orchard,** pointed out that the surplus of the Federation in 1945 was $32,239; in 1946, $35,058; and at the end of this year it will be $39,511. Because of the increased cost of operation, particularly in the publishing of the journal, and need for increased travel on the part of the staff, as well as for travel expenses for officers (set at $1500 for next year), Mr. Orchard's committee suggested a budget for 1948 of $45,850 which is $3000 more than the expected receipts. This budget was passed and provision made for the transfer of funds from surplus to make up the deficit next year.

Under the circumstances, the Board of Control decided that inasmuch as the Federation had shown an increase in net worth heretofore each year, it is sound operation to use some of that surplus in time of need rather than raise dues or advertising rates without due and sufficient notice respectively to the members and the advertisers.

Such action by the Board of Control and the rising costs of operation presage increases in advertising rates in 1949, and possible increase in membership dues.

Presidents

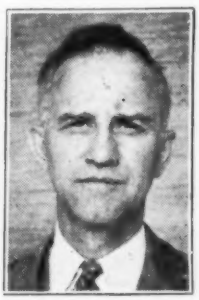
Incoming
Geo. S. Russell
Cons. Engr.
St. Louis, Mo.

Outgoing
Francis S. Friel
Cons. Engr.
Philadelphia

Vice President
V. M. Ehlers
Ch. San. Engr.
Tex. Health Dept.
Austin, Tex.

New Associations' Directors

F. C. Dugan
Dir. Div. San. Eng.
Ky. Health Dept.
Louisville, Ky.



L. L. Hedgepeth
Dir. Va. Stream
Poll. Control Bd.
Richmond, Va.

K. S. Watson
Chem. Engr.
W. Va. Wtr. Comm.
Charleston, W. Va.

PUBLIC RELATIONS PROGRAM PAYS OFF

Bond Issue Carried as Result of Educational Program

By
W. M. KUNSCH,
Engineer-Manager
URBANA-CHAMPAIGN SAN. DIST'R.
URBANA, ILL.

THE Urbana-Champaign Sanitary District had two ideas to sell its voters. The first was for the issuance of new bonds to provide for construction of increased capacity, and the second was the approval of a pension plan for the district's employees. Both ideas were approved at a special election held on July 29. True, the vote was not large, but the absence of a large vote and the overwhelming majority of those in favor of the plans indicated that all efforts to sell these two ideas to the populace had been successful. The vote on the bond issue was 301 to 100, and on the retirement plan 292 to 105.

It is the feeling of those associated with the District that the public relations program and the publicity given to the discussion of the proposals were successful, and because we believe that the publicity program is probably a normal one for a community of this size, we have accepted the invitations of the editors of *Water and Sewage Works* to explain in more or less detail how the public relations and publicity program was developed.

Early Publicity

The earliest publicity, of course, came from newspaper articles covering our sanitary district Board meeting in which the necessity of a bond issue was discussed. The bond issue in question was fairly well headlined in articles on four different dates during May, June, and July. In addition, during the last month before the special election, a total of ten talks was given at various service clubs in the two cities, and to the city councils and the chamber of commerce. Groups covered included the American Business Club, Champaign-Urbana Lions Club, the Urbana Assoc. of Commerce, Champaign Rotary Club, Champaign Toastmasters Club, and Urbana City Council, the Urbana Rotary Club, the Champaign City Council, Urbana Exchange Club, the Champaign-Urbana League of Women Voters, Champaign-Urbana Kiwannis Club, and the Champaign Exchange Club.

The Author

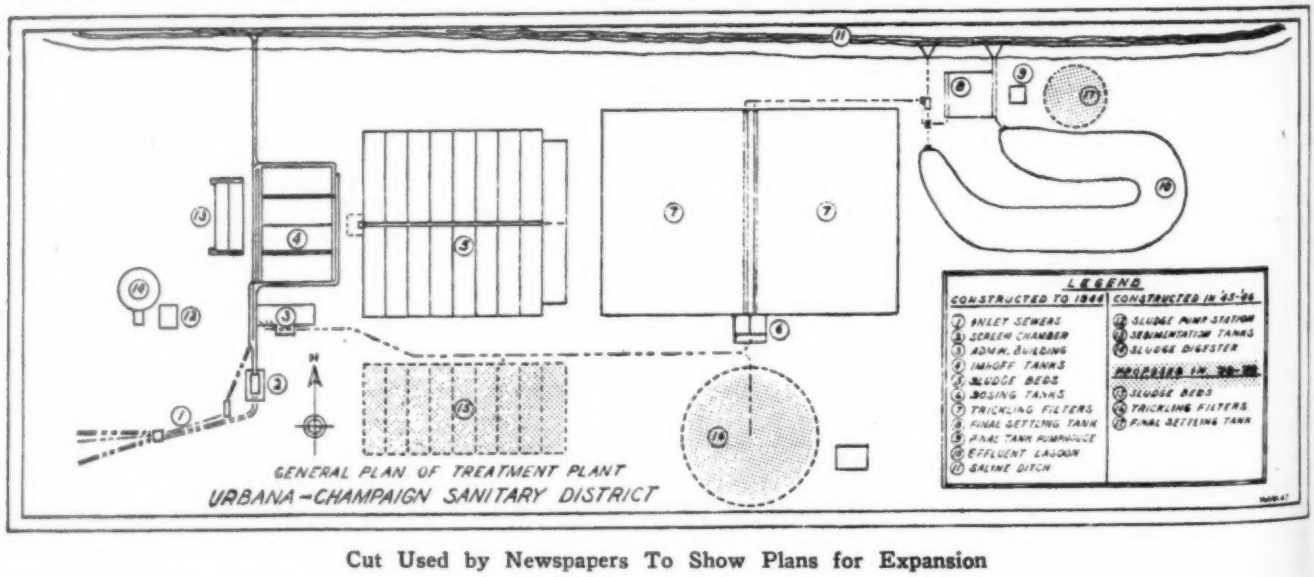
All of the talks, except two, were brief and covered no more than ten minutes of time. Some of these service club talks received considerable newspaper publicity and both local papers gave headline stories and editorial comment in their Sunday issues preceding the bond issue. Both newspapers carried cuts of the g neral plan of the Sanitary District Sewage Treatment Plant showing both present and proposed treatment units. The Chamber of Commerce and the League of Women Voters publicly announced their support of the propositions.

Talks to Service Clubs

In connection with our talks to the service clubs we used a chart showing the principal units of sewage collection and treatment in blocks whose height indicated population capacity. We felt that by the use of this chart the main information could be more quickly and easily understood by the audience in the brief time allotted than would be possible without this chart.

The chart which we used was about 20x28 in. in size and proved adequate for a small audience, but could have been larger for groups meeting in large rooms. A copy of that chart is reproduced herewith.

From this chart and comment, the need for additional funds for sewers and for further plant additions was pointed out. It was explained that sewer costs were estimated in 1945 at $280,000 and that a bond issue, plus the university grant, together



Cut Used by Newspapers To Show Plans for Expansion

with available cash, covered that figure at that time. The right of way was settled, the design completed in early 1946, and the first contract let in May of that year. Thereafter construction costs soared and four bid openings were required before all the work was awarded. With the increase in prices, it was obvious that the original funds were sufficient to construct only 80 per cent of the work. Those lines relieving overloaded conditions in most of Champaign were not constructed and it therefore had become necessary to complete these lines to prevent unsanitary conditions and to provide for city expansion already in progress.

The need for further plant addition is caused principally by rapid population increase from 1945 to '47. It was explained to the service clubs that total population jumped from 50,000 in 1940 to 65,000 in 1947, with the average connected population increasing from 43,000 in 1940 to 56,000 in 1947.

Referring to the chart, it is observed that the original construction in 1923 to 1924 provided for intercepting sewers for 10 mgd., supposedly for a population of 67,000 to be reached in 1960. Actually the sewers have been overloaded repeatedly from 1927 to the present. The new sewers will give a total capacity of 22 mgd., for a population load of 77,000 in 1980. The Imhoff tanks were adequate for a 33,000 population and sedimentation and digestion added in 1945 increased the capacity to 55,000 population predicted for 1955, but the population is already 65,000.

Similarly it was explained to the clubs that other units, while designed for normal growth capacities, were now insufficient in size. The sludge beds need to be increased by 50 per cent. Filters built for a predicted population of 55,000 in 1955 need to be increased to 77,000 to provide for

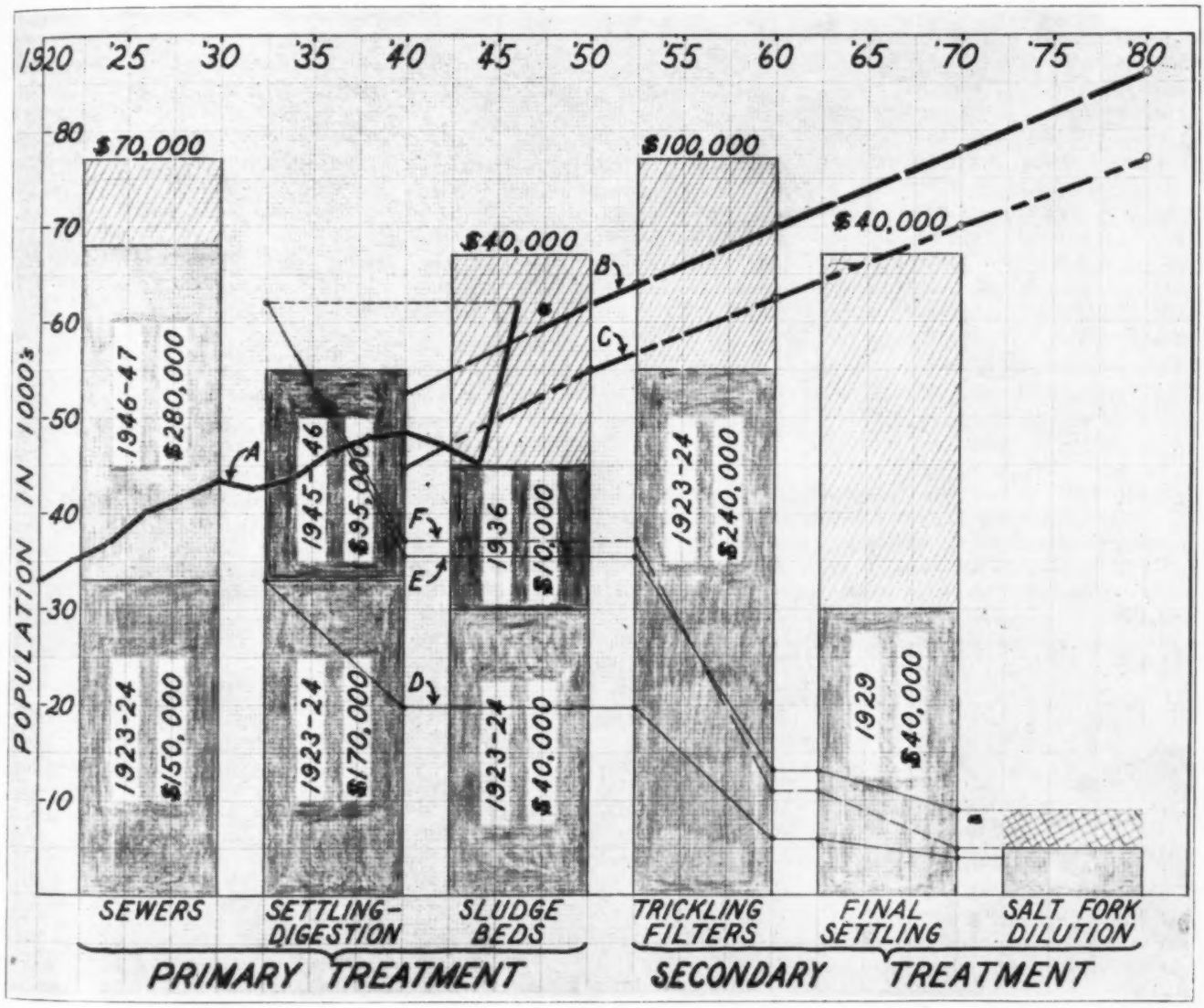


Chart Used in Connection With Service Club Talks

Population Curves plotted against years as follows:

Curve A: *Actual* 1946 *resident population including students.*

Curve B: 1944 *consultant's prediction of connected population.*

Curve C: 1923 *consultant's prediction of total population.*

Population Equivalent removed by the various units as follows:

Curve D: *P.E. load removed by units in* 1924-25.

Curve E: *P.E. load removed by units in* 1946-47.

Curve F: *Theoretical requirement of P.E. load removal by the units in* 1946-47 *in order not to overload the receiving stream.*

The bars show the relative capacity of the units in population equivalents. The lower shaded portions indicate the original design (and cost); the upper shaded portions are planned additions; and the cross hatched portions are the proposed additions (and costs). Dilution with the waters of Salt Fork Creek carries a small portion of the load.

future growth, and a final sedimentation tank which allowed for a population load of only 30,000 required alteration and increased capacity to meet the present population equivalent of 67,000.

In these various talks it was explained to the public, that funds for the completion of all of this work should be voted at the present time in order to avoid a further bond issue in two or three years, and to allow time for design and construction. If the bond issue advocated were not favorably voted, sewers and sludge beds would have to be built in any event and paid for by the issuing of revenue bonds at a higher cost. It was further explained that plant loads were now so heavy that the efficiency of the removal of solids and the oxygen demand had dropped to 85 per cent. As the contributing population increases, this efficiency must be stepped up to approach 95 per cent if the receiving stream is to be kept in good condition. Furthermore, it is the belief of the Sanitary District that increased capacity should be provided so that outlying areas can be encouraged to join the sanitary district.

The relatively inexpensiveness of the issuance of these bonds and the operation of the Sanitary District was explained by pointing out that on the present assessed valuation of the property, the tax rate to cover the cost of operation of the plant and the retirement of these new bonds would be approximately 7 cents per hundred dollars. This is equivalent to but $1.50 per person per year, a very favorable rate when compared with taxes for sewage collection and treatment in other cities. (Several Illinois cities of similar size were listed with costs of $2.08 to $2.63 per capita per year.)

The Pension Plan

In the course of the talks to the various service clubs and to the newspapers, the importance of a pension fund for the district's employees was explained. The plant now has 10 employees, none of which have the benefits of social security, and three are approaching retirement age. (One man has been on the job 24 years.) The rate of pay for these sewage plant operators has always been low compared with workers of similar skill in the area. The annual cost of the pension plan will be less than $2,000 a year and no extra taxes will be required for its operation.

Construction Plans

A portion of the bond issue will be spent to complete the sewer construction which was designed in 1944 and 1945 and that work will proceed immediately. We also have plans completed for new sludge drying facilities, including a pumping station and about 22,500 sq. ft. of sludge bed. Some $66,000 will go into the completion of the $340,000 system of new interceptors started in 1946 and $39,000 will go into the construction of the nine sludge beds, the pump station, and the sludge lagoon. The new beds will be 100 ft. long and 25 ft. wide. Commencement of this latter work will depend to a great extent on the availability of pumps and cast iron pipe.

The balance of the money will be spent for modernization of the existing trickling filter system to induce greater capacity, and the construction of a new final settling tank, 65 to 70 ft. diameter. Trickling filters will cost $100,000 and the settling tank $45,000. The design of this latter work has not yet begun but we hope to have the design and construction completed within a two-year period.

The above was the gist of the talks presented before the various service clubs and the material given to the newspapers. We had considered the use of paid advertising to call the attention of the election to the public but decided against this since we were convinced that the approval would be forthcoming in the election without it, and we also felt that there might be some criticism of the idea of spending public monies for this purpose by the tax-paying public.

Editorial Comment

Editorial comment in the two local newspapers was highly pleasing. In one instance, under the title "Approval is Necessary," the newspaper said "There need be no reason for hestitancy in voting for approval of this program . . . The Sanitary Board has a good record. In years when its expenses are down it has been known to reduce its tax levies. Tuesday's referendum is occasioned by circumstances beyond the Board's control and its approval is necessary."

Another editorial of considerable interest followed the bond issue election and the tenor of the editorial was to decry the lack of public interest in the referendum. The editorial stated that "A public which shows so little concern in what is being done with its money can have little cause for complaint with the operation of the agencies which serve it."

While we agree that the public should show greater interest and concern over the expenditures of tax monies, we feel certain that the apparent lack of interest in the voting was actually an approval of the manner in which we have successfully operated for a number of years. We believe that many people feel, as did the newspaper editorial, that the sanitary district board has a good record, and because they felt that way they did not take the time and trouble to come and vote "yes."

We are convinced, too, that had we not given our program adequate publicity and made an effort to develop good public relations through our meetings with various service clubs, there would undoubtedly have arisen more opposition to the whole project.

Acknowledgement

The work of developing our publicity program was not a one man show. Our president of the Board of Trustees of the Sanitary District, Frank D. Murphy, made a very fine talk before the Champaign Rotary Club, and Ralph Wilson of our firm of consulting engineers, Wilson and Anderson, also made a talk before the Lions Club. The idea of employing the chart was the suggestion of E. M. Anderson of the same firm which had been retained to design the intercepting sewers and additional sludge beds.

"Inflation"

"This water-works job is paying so little, and prices are so high, I decided to use up my wife's war-job overalls."

PROPOSED WATER POLLUTION LEGISLATION*

by M. LeBOSQUET, JR.
Senior Sanitary Engineer
U. S. PUBLIC HEALTH SERVICE
CINCINNATI, OHIO

THIS paper is an attempt to outline the events which have transpired, particularly in the last twelve months, in regard to various proposals for Federal water pollution control legislation.

Bills dealing with water pollution control have been before the Federal Congress for over fifty years, and one hundred bills of various types and descriptions have been considered. Of these one hundred or more Federal water pollution bills, no bill which provides for a broad activity in the water pollution field has passed and become law. On three occasions, however, a comprehensive bill made definite progress through the Congress. In 1936 a bill was passed by both houses of Congress but was returned by request to the Senate for reconsideration. In this case, time did not permit such reconsideration and Congress adjourned before taking action. Again, in 1938, a bill was passed by both houses of Congress but was vetoed by the President because of certain defects in the bill relative to the allocation of grants. These defects were removed in more recent bills. On a third occasion, in 1940, bills were passed by both House and Senate, but the Senate refused to concur in a House amendment and no further action was taken.

Existing Federal Pollution Legislation

A number of limited Federal laws are now in effect. While most of these provide for Federal participation in stream control matters in an advisory capacity, there are one or two which provide for enforcement in the control of certain types of pollution of navigable waters. The River and Harbor Act of 1899 contained a provision to prevent shoaling by the discharge of solids which would result in interference with navigation. The Oil Pollution Act of 1924 similarly applies to navigable waters and is intended to prevent the discharge of oil, and so again to protect navigation.

In 1946, Public Law 732 was passed, giving authority to the Fish and Wildlife Service to make certain investigations and specifically to determine possible damage to wildlife resources from water impoundments, particularly those built by Federal agencies.

The Author

The Public Health Service Water and Sanitation Investigations Station in Cincinnati presently operates under a section of Public Law 410, (approved July 1, 1944) which directs that the Surgeon General shall conduct research investigations, experiments, demonstrations, and studies of various matters including water purification, sewage treatment, and the pollution of lakes and streams. He shall make information available through publication of the results of such activities, shall make research facilities available to appropriate public authorities and shall engage in other activities including establishment of fellowships, making of grants, securing assistance of experts, and other means to carry out the purposes of the section.

The Public Health Service is also engaged in approving water for use on interstate carriers, and certifies the individual State shellfish control programs in so far as shipments interstate are concerned. The Cincinnati Station was established in 1913, under a previous law superseded by Public Law 410.

Action Prior to 80th Congress

Bills before the 79th Congress were revisions of bills considered by previous Congresses but changed to incorporate newer ideas and to remove certain objections raised during previous Congressional consideration. The bills before the 79th Congress are of particular interest as they furnished the starting point in the drafting of bills before the present Congress, now in recess.

Five bills were introduced into the House of Representatives of the 79th Congress and none was passed.

At a meeting in Cleveland, Ohio, on November 11, 1946, the Conference of State Sanitary Engineers adopted a resolution on Water Pollution Abatement which recommended to the State and Territorial Health Officers Association that Federal legislation dealing with water pollution control be favored, and furthermore that such legislation include certain basic provisions which were enumerated. On December 5, 1946, the State and Territorial Health Officers Association approved this recommendation and adopted a similar resolution.

For the purpose of carrying out the directive of the State Sanitary Engineers' Conference, Arthur D. Weston, Chief Sanitary Engineer for the Massachusetts Department of Public Health and Chairman of the Water Policy Committee of the Conference of State Sanitary Engineers, arranged a meeting on November 22, 1946, in New York City. Organizations represented at this conference (since generally referred to as the New York Meeting) included Incodel, the State Commission on Stream Pollution in the Ohio River Valley, *Waterworks Engineering*, the N. Y. State Health Department, Engr. Sect. of A.P.H.A. and the A.P.H.A., the Interstate Sanitation Commission, the U. S. Fish and Wildlife Service, the Izaak Walton League of America, the U. S. Public Health Service, the Conn. Dept. of Health, the New England Water Wks. Assn., and the Conf. of State San. Engrs.

One of the principal contributions of the "New York Meeting" was the drafting of a new "Enforcement Clause." Previous bills had included a clause providing that the Surgeon General recommend State action for the abatement of pollution in individual cases, and if action to abate

*Presented before the annual meeting of the Ohio Conference on Sewage Treatment at Columbus, Ohio, Oct. 2, 1947. Released by the Federation of Sewage Works Assns. for publication in *Water & Sewage Works*.

such pollution was not taken within a time specified, the Surgeon General should recommend to the State that suit to abate pollution be initiated forthwith.

The "New York Meeting" added a clause providing that if suit were not initiated within a reasonable time, not to exceed two years, action would be brought in the name of the United States. This is the "Residual Federal Control Clause" designed in an attempt to gain support, not only of those favoring Federal police power but also those favoring primary responsibility for the abatement of pollution in the hands of State and local officials.

Another addition made at the "New York Meeting" was to make enforcement provisions of this bill applicable to "Interstate Waters" only.

80th Congress

Until the recess, the 80th Congress had made definite progress toward the enactment of a Federal water pollution law. Three bills were introduced in the House, two of them identical, and one joint bill was introduced in the Senate. These bills were as follows:

Mundt,
HR— 123, Jan. 3, 1947

Barkley-Taft-Spence-Elston
S — 418, Jan. 29, 1947
HR— 315. Jan. 3, 1947
HR— 470, Jan. 6, 1947

Mundt, revised
HR—3990, June 26, 1947

In the Senate, S-418 was referred to a subcommittee headed by Senator George W. Malone of Idaho, of the Committee on Public Works. Hearings were held in April and May, 1947, and as a result amendments were made in S-418, the bill was reported out with a recommendation that it pass and, before the Congress recessed, the Senate passed the bill and referred it to the House for consideration.

In the House, hearings were also held in June, 1947. At that time the Senate had not yet passed S-418, and so the House hearings did not include consideration of this bill, although it is thought possible that the committee will consider the bill as passed by the Senate before making its report to the House of Representatives. HR-3990 was introduced into the House late in the session and contained certain of the amendments and suggestions offered as to S-418.

S-418 as Amended

The changes made in the Senate committee are described in detail in their report dated July 8, 1947, Calendar No. 477, Report No. 462. Rather than go into details of the many bills before Congress, I have abstracted S-418 as amended, section by section, and will discuss, at appropriate points, the changes made at the "New York Meeting" and the amendments written in by the Senate Committee.

Purpose—"To provide for water pollution control activities in the Public Health Service of the Federal Security Agency and in the Federal Works Agency, and for other purposes.

One of the principal amendments was to write the Federal Works Agency into the bill, with responsibility in connection with making loans, reviewing designs, and executing pollution abatement remedies. Responsibility is still vested in the Public Health Service for diagnosis of the causes of stream pollution, the development of remedies, and the justification of expenditures.

Section 1—states it is "to be the policy of Congress to recognize, preserve and protect the primary responsibilities and rights of the States in controlling water pollution and to provide Federal technical services and financial aid. The section also places certain responsibilities and authority in the aforementioned agencies.

This statement in regard to policy was not in bills previous to this year. Presumably it is designed to reassure State and local authorities that it is not the intention of Congress to encroach and interfere with State and local activities. It has been the policy of the Public Health Service to encourage, support and strengthen State and local health organizations, and this section places that policy on record.

Section 2 (*a*)—Surgeon General shall prepare comprehensive programs in cooperation with other Federal agencies, with State and inter-state agencies, and with municipalities and industries involved. Programs shall be for protection of public water supplies, fish and aquatic life, recreational purposes, agricultural, industrial and other uses. Investigations shall be made.

This section has been in bills for some little time, and although certain revisions in wording have been made, the section has met with general support.

Section 2 (*b*)—Surgeon General shall encourage State activities, encourage enactment of uniform State laws, encourage compacts, and make public the results of surveys, studies, investigations, and experiments.

Section 2 (*c*)—Consent of Congress is given to States to form compacts. Such compacts shall be in effect when approved by the Congress.

The last provision of this section was added by the Senate Committee to clarify this legal point.

Section 2 (*d*)—(1) Pollution of waters by one State injuring the health and welfare of persons in another State is declared a public nuisance and subject to abatement as provided.

Another amendment clarified the wording in regard to interstate waters, to make it understood that any waters whose pollution endangers the health and welfare of persons in a State other than that in which the discharge originates would be included.

Section 2 (*d*)—(2) When the Surgeon General finds a public nuisance as above, he shall notify the person causing the discharge, and advise the State or interstate agency of such notification. Notification may recommend corrective measures, and specify a reasonable time for abatement. If action is not taken in time specified, failure will be brought to the attention of the person causing the discharge and the State agency. Notification to the State agency may recommend that suit be initiated.

Section 2 (*d*)—(3) If no action results, the Federal Security Administrator is authorized to call a public hearing before a board of five or more persons appointed by the Administrator, who may be from the Federal Security Agency or the State or interstate agency, except that one member shall be from the water pollution agency where the discharge originates, and one shall be from the Department of Commerce, and the majority shall be persons other than from the Federal Security Agency. The Board shall make recommendations to the Federal Security Administrator concerning reasonable and equitable corrective measures.

Section 2 (*d*)—(4) After affording the defending person reasonable additional time, and with the consent of the State water pollution agency, the Federal Security Administrator may request the Attorney General to bring suit on behalf of the United States to secure abatement.

Rather than make a two-year limitation between the time of recommended action to the States and action by the Federal authority, the reasonableness of the time is left for ultimate determination by the courts. This same section also is amended to provide that no action will be taken by the Federal court without the permission of the State pollution control agency.

Section 2 (*d*)—(5) With the consent of the State water pollution agency, additional offenders may be joined as defendants at any time.

Section 2 (*d*)—(6)—If offenders are from different judicial districts, suit may be commenced in any district involved in a discharge.

Section 2 (*d*)—(7) Court evidence shall include proceedings and recommendations of the Board and other evidence. Court may enter judgment and orders enforcing such judgment.

Section 2 (*d*)—(8) Definition of "person" includes individual, corporation, partnership, association, State, municipality, or other political subdivision.

The above enforcement section has been the subject of a very thorough discussion extending over a period of years. The version in amended S-418 was almost entirely rewritten by the Senate Committee. It is the section providing for residual Federal enforcement.

The detailed analysis of the Senate revision of the enforcement clause indicates that it would be several years between the time a pollution discharge is made and the time that Federal action would be effective. In these several years, the defendant or the State involved would have ample opportunity to correct the pollution or to bring action under State authority. Even after this time is elapsed, it is to be noted that action would not be taken in the name of the United States without the consent of the State involved. In other words, if the State needed Federal assistance, it could secure it, while if the State did not desire Federal assistance, the State is fully protected. This provision of requiring State approval before action is taken is an addition made by the Senate Committee in rewriting the bill. The bill as drafted at the New York meeting provided for deferred Federal action but did not require consent of the State after the period of delay had elapsed.

Section 3—The Surgeon General may upon State request make investigations and surveys with a view to recommending a solution.

Section 4—The Surgeon General shall prepare and publish reports of surveys, studies, investigations and experiments, and make recommendations on pollution control.

Section 5—The Federal Works Administrator may make loans to any State, municipality or interstate agency for treatment work or for preparation of plans, if the project is approved by the State agency, the Surgeon General, and is included in a comprehensive program and if the loan is not exceeding 33⅓ per cent of the cost. Loans shall bear interest at 2 per cent and bonds must be authorized legally. Bonds may be subordinated to other bonds or obligations.

Whereas the original S-418 had a provision for Federal grants-in-aid, the amended version restricts Federal aid to loans at 2 per cent per annum. This amendment was made on the basis that the present favorable financial position of many political subdivisions makes the necessity for Federal grants-in-aid less urgent. The favorable loan provision was thought to be adequate stimulus. The loans are to be subordinated to other loans, so that bonds for the balance of the two-thirds may be issued at very low rates of interest, inasmuch as only two-thirds of the cost would be covered.

It will be noted in this section and in Section 6 that authority for making loans is changed from the Public Health Service to the Federal Works Administrator instead of the Federal Security Administrator. In this manner the experience of the Federal Works Administrator in looking after legal, financial and other matters pertaining to the security of a loan is utilized.

Section 6—The Federal Works Administrator is authorized to make loans to industrial enterprises for treatment works and engineering reports and plans for projects approved by the State and by the Surgeon General and included in a comprehensive program. The loan shall be for 33⅓ per cent of the estimated cost, shall be fully secured, and shall bear interest at the rate of 2 per cent. The loan shall be for a maximum of 10 years.

Section 7 (*a*)—The Surgeon General and Federal Works Administrator shall review reports, investigations, surveys, plans, etc. In determining desirability of projects and loans, consideration should be given to public benefits, propriety of Federal aid, public interest, public necessity, and adequacy of provisions for operation and maintenance.

Section 7 (*b*)—Establishes a water pollution advisory board composed of the Surgeon General or sanitary engineer officer designated as chairman, a representative from the War Department, a representative from the Department of the Interior, a representative of the Federal Works Agency, and a representative of the Department of Agriculture, as designated by the respective Secretaries of these departments and agencies, and six persons not Federal employees, appointed by the President. One person shall be an engineer, expert in sewage and industrial waste disposal, one person interested in wildlife conservation, one representing municipal government, and one representing State government, and one representing industry. Board shall review policies and programs and make recommendations to Surgeon General.

Section 7 (*c*)—Authorizes annual appropriations not in excess of $100,000,000 for any year for loans under Sections 5 and 6, sums to be available until expended.

Section 7 (*d*)—Authorizes appropriations as necessary to carry out the act.

Section 8 (*a*)—Authorizes appropriations of $5,000,000 per year to be allotted and paid to State and interstate agencies for conduct of investigations, surveys and studies. Amounts allotted and not spent shall be available for allotment in succeeding fiscal years.

Section 8 (*b*)—Authorizes appropriations of $12,000,000 per year for advance by Federal Works Administrator to States, municipalities, interstate agencies, to aid in financing engineering architectural economic investigations and studies, surveys, plans, designs, working drawings, and other action preliminary to construction of projects approved by States, pollution agencies and by Surgeon General. Advances repayable without interest upon commencement of construction.

Section 9 (*a*)—Provides for appointment of engineer and scientist officers in the higher grades of the Public Health Service, with the limit of 5 such officers holding office at one time.

Section 9 (*b*)—May use other personnel to assist in carrying out the act.

Section 9 (*c*)—Provides for transfer of funds from Federal Security Administrator to Federal Works Administrator for making loans under Sections 5 and 6. Priority of project is to be established by the Surgeon General. The Federal Works Administrator shall furnish written reports on progress. The Federal Works Administrator is authorized to hold, administer, exchange, refund or sell any bonds or other obligations evidencing loans, and to collect interest on and principal of such bonds and other obligations. Moneys received shall be conveyed to the Treasury as miscellaneous receipts.

Section 9 (*d*)—The Surgeon General and the Federal Works Administrator are authorized to prescribe necessary regulations.

Section 10—Defines "State water pollution agency" "interstate agency" "treatment works" "State" "interstate waters" and "municipality."

Section 11—No provision of act shall limit functions under any other act of the Public Health Service, or any other Federal official, or affect the oil pollution act, or the provisions of any treaty.

Section 12—Saving clause.

Section 13—Cited as "Water Pollution Control Act."

Discussion

The legislation as revised by the Senate Committee and as passed unanimously by the Senate on July 16, 1947, is a compromise in numerous respects and the Senate Committee is to be commended for its efforts. A brief discussion however, of the omissions and changes from the standpoint of interested persons and organizations may be timely.

The amended S-418 eliminated the 33⅓ per cent grants which were in previous bills. This may be con-

sidered unfortunate by some, as it is pointed out that during the 1930's tremendous strides were made in the installation of water pollution abatement works through the impetus given by Federal grants-in-aid. On the other hand, many persons will support this curtailment of the expenditure of Federal grant-in-aid funds.

Individuals and organizations which feel that there should be no police power at the Federal level in regard to water pollution matters may be displeased that there is a Federal residual enforcement provision in S-418, revised. On the other hand, strong advocates of Federal control will feel that amended S-418 has in effect no Federal control, inasmuch as State permission is required before Federal action can be effective.

A number of previous bills before Congress have had a clause placing a ban on new sources of pollution. Such a ban has been thought advisable to prevent the further encroachment of pollution on the quality of our surface waters. Others, however, have held that such a ban would prevent growth and expansion of industries and therefore would be undesirable. One compromise proposal which has received considerable support is that a new pollution prevention clause should be inserted which would not ban new sources of pollution but would ban new "outlets." With such a provision, the extension of a sewer or the expansion of an industry would not require special permission from an administrative agency. The "new pollution" clause proposed is not uncommon, as it is in effect in many States.

Present Status

As matters now stand, the Senate has considered all proposed Federal water pollution control bills placed before it and has passed the one bill, S-418, on July 16, 1947. Further action by the Senate, if any, will depend on developments in the House of Representatives.

The House of Representatives has had four bills introduced, two of which are identical, and hearings have been held on three of these bills. In addition, it has now received the bill passed by the Senate for action. Hearings have not been held in the House on Senate Bill S-418, nor have they been held on the last pollution bill introduced, HR-3990. The House, however, did consider to a limited degree the Senate bill and the testimony before the Senate on this bill. Many of those testifying at the Senate hearing also testified at the House hearing, so that many of these comments were repeated. Possible future activities of the House might include hearings on the two bills before it, not already considered. Inasmuch as the House Committee has already held extensive hearings on the subject of water pollution, further hearings may be omitted and the committee, if it approves of any one of the bills it has considered, will report that bill, with or without amendments, to the House of Representatives.

If the bill reported by the House Committee and passed by the House is S-418, but with amendments, a joint conference between representatives of the House and the Senate would be necessary to resolve the differences between the two Houses of Congress, unless the Senate is willing to accept the House amendments. Upon agreement by the conferees, the bill would be referred back to the House and the Senate for approval by them.

If the House Committee should report out a bill other than S-418, and if this bill should be passed by the House, nothing could be accomplished until both Houses of Congress had acted on a bill with the same number and until both Houses had come to agreement on the contents of that bill. These are mere possibilities, and any further action toward enactment of Federal water pollution legislation is in the hands of the Congress of the United States.

Policy of the Public Health Service Relative to Federal Legislation on Water Pollution Control

The general magnitude and importance of the water pollution problem in the United States, and its relation to the various uses of water and the public health have been well established. Likewise, the inability of State and local authorities to adequately control the pollution of interstate waters without the assistance of the central coordinating agency has been demonstrated over the years.

It is generally recognized that there is a need for Federal legislation to provide a stimulus to water pollution abatement activities and the necessary coordination of existing control authorities.

The Public Health Service has been engaged for many years in the investigation of interstate water pollution problems, individually and in cooperation with State and Federal agencies. This activity has been limited in scope since it has, of necessity, been confined to investigations.

The Public Health Service is interested in any Federal legislation dealing with the pollution control of interstate waters which provides for the following items:

1. Provisions for a Federal agency to act as a coordinator and advisor in matters pertaining to water pollution and its abatement, with authority to carry on investigations and other activities necessary in developing more efficient methods of treatment of sewage and wastes and in preparing comprehensive water pollution abatement programs.

2. The authorization for appropriations of funds sufficient in amount to permit the Federal agency to properly carry on the duties assigned to it.

3. Provision for an advisory board to the agency, the membership of which will include representatives of Federal agencies officially concerned with uses and control of water resources which may be affected by pollution.

4. Permission for States to form interstate compacts for cooperative effort in the prevention and abatement of pollution of interstate waters.

5. The authorization for appropriation of funds for allocation to States for promotion, investigations and preparation of engineering reports and plans necessary for the prevention and abatement of water pollution.

6. The authorization for appropriation of funds for grants-in-aid or loans to civil subdivisions of government and loans to persons for the purpose of constructing sewage and waste treatment works.

7. Provision for the continuing interest by the Federal authority in the efficient operation of completed projects to insure that maximum benefits are derived from improvement works on which Federal funds have been expended.

8. The Public Health Service makes no recommendations at this time relative to the nature or degree of regulatory or enforcement provisions in water pollution control legislation. The decision as to the extent to which the Federal government should be provided with, and exercise police powers in the control and abatement of water pollution is a matter primarily of legislative policy to be determined by the Congress.

A SIMPLIFIED VACUUM FILTER

by

T. R. KOMLINE*
Chief Engineer
KOMLINE-SANDERSON ENG. CORP.
RIDGEWOOD, N. J.

THE advent of the Cord Filter for the dewatering of sewage sludges and industrial wastes has made possible a number of basic changes in vacuum filter construction that have resulted in a simple, foolproof machine.

The development work on a standard, conventional 8x6 ft. filter indicated that the customary filter cloth and drainage system generally utilized could be dispensed with, because the cord arrangement which lifts the sludge cake from the drum furnishes its own drainage—(Fig. 1). The space between each cord in the lower set of cords next to the drum face (called the drainage cords) provides a space along which the water removed from the solids left behind on the top set of cords (the filtering cords) may travel to the filtrate draw-off system. This permits the cords to be laid directly on the drum, a circumstance which produced the thought that perhaps the drum face could be provided with a series of parallel, axial, open troughs into which the filtrate being carried off by the drainage cords could discharge, and from whence it could be removed by a series of radial draw-off pipes located outside of the drum head (Fig. 2). Each drainage trough is connected to its individual filtrate pipe which leads through the trunnion to a ported filtrate valve that allows the vacuum to be applied to the sludge being dewatered, except for that portion of the cycle during which the cords have left the drum for discharge of the cake and subsequent washing.

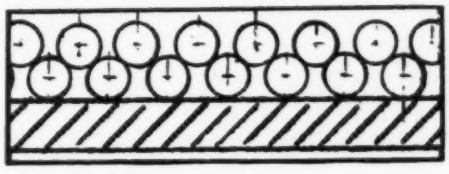


Fig. 1.—Cord Arrangement on Drum
(Cut made to actual size of cords.)

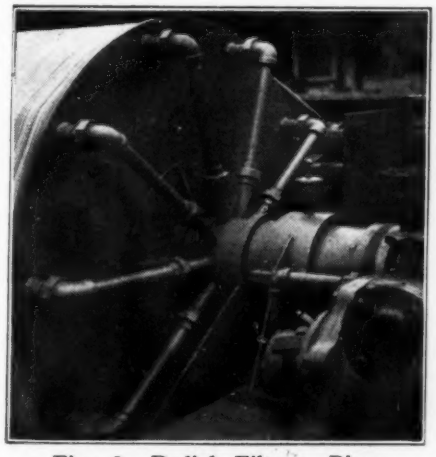
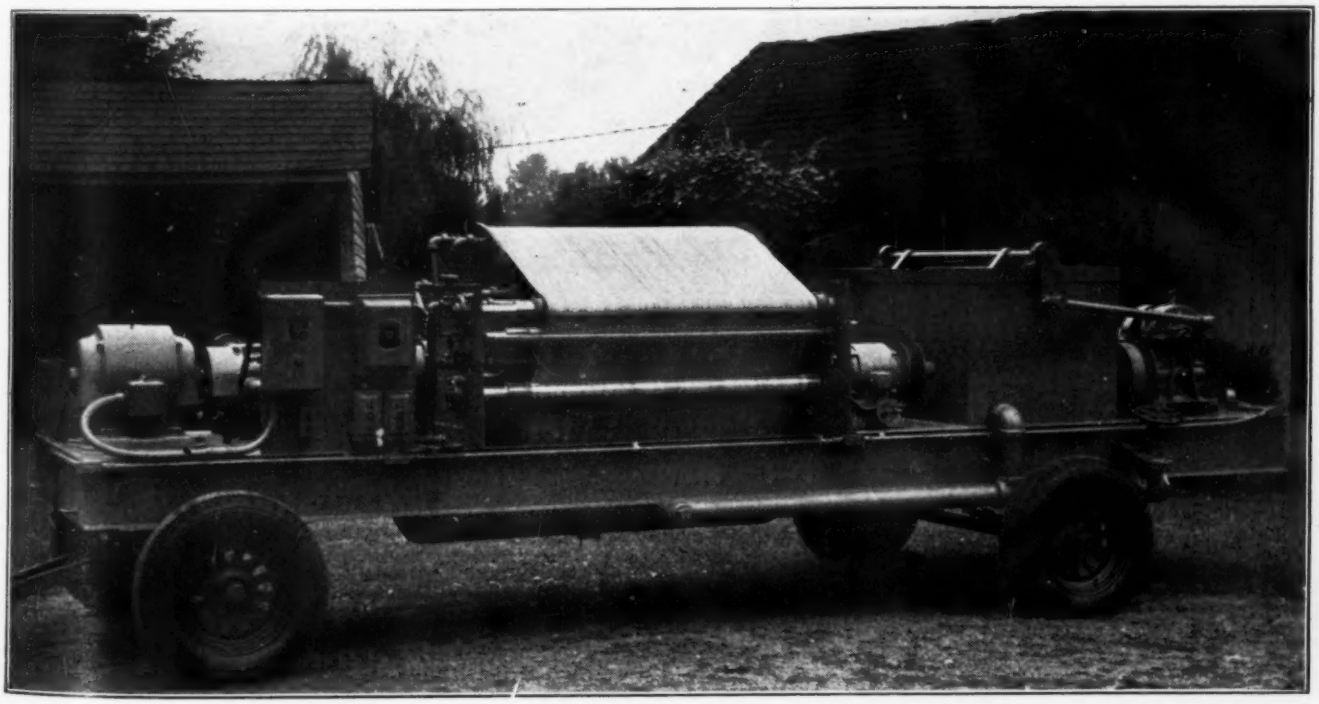


Fig. 2.—Radial Filtrate Pipes
(Readily accessible and easily removed for cleaning, these pipes take off from open channels beneath cords.)

The design and construction outlined above, and here illustrated, possesses a number of practical advantages. With this simple drum construction with its novel open filtrate passages and easily accessible exposed filtrate piping (Fig. 2) maintenance of the few parts utilized becomes easy. The fact that the filtrate piping is entirely on the outside of the drum and readily accessible for lime scale removal, or replacement when working under corrosive conditions, should have an especial appeal to the plant operator as well as the engineer. This design lends itself to welded construction and the use of high-silicon bronze in sewage works installations for the drum and piping. Based on previous experience with this resistant alloy, this structure should last for many years.

With respect to the cord material,

*The author for a number of years was engaged in plant operation as Asst. Supt. of the Joint Sewage Treatment Works of Plainfield, N. J., where many new ideas in operation and process developments have originated.—Ed.



The Complete Mobile Unit for Experimental Runs and Demonstrations

a cotton braided rope, such as utilized for power transmission in textile mills, has been utilized in the past. For use under acid or alkaline conditions the portable unit is now equipped with "Vinyon" cord. This material which is a filamentous plastic is resistant to practically all acids and alkalies, and is water repellant and mildew and rot proof.

The drum construction and filtrate piping were tried on a 4x4 ft. filter that has been worked up into the complete portable vacuum filtration unit here pictured. This mobile unit is equipped with a sludge pump, coagulant mixing tank, vacuum pump and coagulant metering pumps. This has permitted trial of the simplified construction on various sludges, and allows the complete unit to be tried on a number of sludges and industrial wastes, and also in the development of new processes.

Results to date are extremely encouraging, and indicate that this construction and method of sludge dewatering will find wide application.

WATER AND SEWAGE PATENTS

(Of Recent Issue)

WATER PATENTS

Motor Pump Unit. Carl J. Blom (to Byron Jackson Co., Vernon, Calif.); U. S. 2,423,825; July 15, 1947 (Appl. 7-6-45).

Liquid Level Control Device For Pumping Units. Harry Goodman, Britton, Okla.; U. S. 2,424,567; July 29, 1947 (Appl. 4-3-44). Electric apparatus for making and breaking a circuit through contact of a conductive liquid in a sump-pit.

Apparatus and Process for Improving Separation of Clarified Liquid From a Slurry by Subdividing the Slurry at the Separation Interface Into a Plurality of Shallow Streams. Walter H. Green (to Infilco, Inc., Chicago, Ill.); U. S. 2,425,372; Aug. 12, 1947 (Appl. 1-7-43). A slurry type water treating apparatus.

Apparatus and Process for Improving Separation of Clarified Liquid from a Slurry by Maintaining a Slurry Circulation Including a Flow of Slurry Adjacent to the Separation Interface. Walter H. Green (to Infilco, Inc., Chicago, Ill.); U. S. 2,425,372; Aug. 12, 1947 (Appl. 1-7-43). A water treating apparatus of the type wherein, during operation, there is maintained a pool of slurry having a clearly defined upper surface from clear water escapes.

Electrolytic Water Purifier. Theodore C. Jones, Louisville, Ky.; U. S. 2,425,424; Aug. 12, 1947 (Appl. 10-12-45). A self-energizing electrolytic water correction device comprising a tubular metal casing member constituting the positive electrode and strips running through the tube constituting the negative electrode.

Pipe Line Stopper. Frank H. Mueller and John J. Smith (to Mueller Co., Decatur, Ill.); U. S. 2,425,483; Aug. 12, 1947. (Appl. 4-25-45). A pipe line stopper insertable through a side wall opening in a main which has a substantially larger inside diameter than the opening. Stopper has rubber sleeve surrounding it and means for expanding said sleeve to fill pipe.

Liquid Treatment Tank With Concentric Compartments and With Distributors Below the Bottom Surface. Roy Welter (to Graver Tank & Mfg. Co., Inc.); U. S. 2,426,804; Sept. 2, 1947 (Appl. 6-14-44). A liquid treatment tank with an inner flocculation section and annular surrounding clarification compartment, with arrangement for distribution of flow at the bottom and take off of clarified water at the top.

These patent abstracts being brief do not necessarily cover the entire scope of the invention described. If the reader becomes especially interested in any of these patents he should obtain printed copies of the complete patent, at 25 cents each, from the Commissioner of Patents, Washington 25, D. C.

Liquid Treatment Tank with a Solids Impeller Means Having a Normally Submerged Drive Wheel. Augustus C. Durdin III (to Graver Tank & Mfg. Co., Inc.); U. S. 2,427,091; Sept. 9, 1947 (Appl. 10-25-43). An apparatus for the treatment of liquid with precipitation of solids and operation of scraper mechanism by means of a submerged drive wheel running against the rim of the inside wall.

SEWAGE PATENTS

Apparatus For Treating Garbage and the Like Waste Material. Kai Petersen, Soborg, Denmark; U. S. 2,423,994; July 15, 1947 (Appl. 1-19-39). Ball mill type of grinder.

Apparatus for Drying, Heating and/or Cooling Flowable Solids. John L. Erisman (to Link-Belt Co.); U. S. 2,424,228; July 22, 1947 (Appl. 1-14-44). The Roto-Louvre dryer, for sludge drying.

Method of Drying, Heating and/or Cooling Flowable Solids. John L. Erisman (to Link-Belt Co., Chicago, Ill.); U. S. 2,424,229; July 22, 1947 (Appl. 5-6-44). The Roto-Louvre dryer, for sludge drying.

Apparatus for Settling Suspended Solids from Liquid Mediums. William Duncan Swallow (two thirds to George S. Pelton and Herbert E. Pelton); U. S. 2,424,259; July 22, 1947 (Appl. 12-13-43). A flocculating tank, (also for water purification).

Continuous Rotary Drum Filter. Thomas R. Komline (to Komline-Sanderson Engineering Corp., Ridgewood, N. J.); U. S. 2,426,886; Sept. 2, 1947 (Appl. 2-11-47). A vacuum filter on a rotary drum covered with moving cords which move away from the drum and discharge sludge and then return to the drum to act as the filtering surface.

Garbage Grinder. Lee B. Green, Lakewood, O.; U. S. 2,428,420; Oct. 7, 1947 (Appl. 1-29-45). Home garbage grinder.

W. VIRGINIA SEW. AND IND. WASTE ASSN. FIRST ANNUAL MEETING

LAST year the West Virginia Sewage and Industrial Waste Assn. was formed and during the year its membership grew to 89 members. Fifty-three of these were among the 97 persons who registered at the first annual meeting of the association held in Bluefield, W. Va. on Oct. 1 and 2. The conference opened with an address of welcome by A. Harry Vest, Mayor of Bluefield, and a response by President **Kyle L. Bruce,** Supt. Bluefield Sanitary Board.

An annual banquet was held in conjunction with West Virginia Section of the A.W.W.A. **Mike Siebert,** Neptune Meter Co., Richmond, served as toastmaster.

Presidents

Incoming
P. D. Simmons
Water Chem.
Weirton Steel Co.
Weirton, W. Va.

Outgoing
Kyle L. Bruce
Supt.
San. Board
Bluefield, W. Va.

Secretary-Treasurer
R. G. McCall
Assoc. Engr.
W. Va. Hlth. Dept.
Charleston, W. Va.

Federation Director
K. S. Watson
Chem. Engr.
W. Va. Wtr. Com.
Charleston, W. Va.

Programmers

Fundamentals
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Head Civ. Engr.
W. Va. Univ.
Charleston, W. Va.

Chlorination
J. P. Kavanagh
Dist. Mgr.
W & T
Roanoke, Va.

Business Session

Officers elected for the ensuing year were as follows:

President

P. D. Simmons, Water Chemist
Weirton Steel Co., Weirton, W. Va.

1st Vice President

J. E. Settle, Cons. Engr.
Charleston, W. Va.

2nd Vice President

Edward Shroyer, Supt. Filtration
Water Dept., Fairmont, W. Va.

Secretary-Treasurer

R. G. McCall, Assoc. Engr.
State Dept. Health,
Charleston, W. Va.

Federation Director (Until 1950)

K. S. Watson, Chem. Engr.
State Water Comm.,
Charleston, W. Va.

Symposium on Sewage Treatment

This being the first meeting of the association, it appropriately began with a symposium on sewage treatment, for the benefit of new members to this field. Five persons participated in presenting papers during the symposium and then acted as a "Board of Experts" while the audience propounded questions on such basic topics as design, treatment units, and expected results.

H. W. Speiden, Head, Dept' Civil Engr., West Virginia University, opened the symposium with a history of sewage treatment, definition of sewage and its composition, and fundamental concepts of treatment processes. **R. G. McCall,** Assoc. Engr., West Va. Dept. of Health, presented an illustrated lecture on primary treatment, including screenings, grit removal, skimming, primary sedimentation, sludge handling, and disposal of sludge.

Secondary treatment of sewage was the topic assigned to and presented by **John Lester,** Chem. Engr., E. I. duPont de Nemours. Mr. Lester also presented an illustrated lecture and described the design and operation of standard and high rate trickling filters, both the activated sludge process, chemical precipitation and sandfilters.

Disinfection of sewage was described under the title "Chlorination of Sewage" by **J. P. Kavanagh,** Wallace & Tiernan. Mr. Kavanagh discussed contact time, bacterial kill, pre- versus post-chlorination and other factors in chlorination.

"Auxiliary Treatment Equipment" was the title of the talk given by **J. E. Settle,** Cons. Engr. of Charleston. Mr. Settle explained the operation of the many mechanical aids to the improvement of operation of the basic process of sedimentation and solids removal. This session was followed by a paper on "Tannery Waste Treatment" by **Howard Reuning,** Keystone Tanning and Glue Co., Ridgeway, Penna.

Chemical Waste Treatment

H. K. Gidley, Engineer, W. Va. Health Dept., read the commentary to the color film, "Treatment of Some Chemical Wastes." This is the movie prepared by Tom Powers, Supt. Waste Treatment of the Dow Chemical Co., Midland, Mich., and shows the operation of the treatment plant of that company. **P. D. Simmons,** Water Control Chemist, Weirton Steel Co., Weirton, W. Va., told how phenol could be recovered from or treated in the wastes from by-product coke plants.

Water Commission Approach

The cooperative program advanced by the W. Va. State Water Commission to solve the stream pollution problems of that state was explained by **Kenneth S. Watson,** Chem. Engr. of the Commission.

Another timely paper in view of the fact that many industries are conducting extensive studies on waste problems was the paper on "Flow Measurement," presented by **Walter N. Stancat**[1], Foxboro Meter Co., Pittsburgh, Penna.

Inspection Trip

As an introduction to the field trip to Bluefield's pride and joy, the sewage treatment plant, **Marvin Williams,** Chemist Bluefield Sanitary Board, read a paper on "Ten Years' Operation of the Bluefield Sewage Treatment Plant." Mr. Williams' paper emphasized the importance of good operation and good records. The treatment plant itself was a prime example of good housekeeping and efficient operation.

Comments of the Editors

Can the Small Plant Afford Engineering Advice?

During the recent meeting of the West Virginia Section of A.W.W.A. one of the topics on the program for discussion was the question of whether or not the cost of services of a consulting engineer can be justified by the water departments of the smaller municipalities. To our thinking the question might better have been can the small municipality afford not to employ engineering advice in connection with operation and maintenance as well as improvements to the water works system?

In answering this important question considerable evidence was forthcoming to show that studies of plant equipment and operation of small water works by qualified consultants almost without exception had paid handsome dividends in the form of reduced operating and maintenance costs.

One engineer of considerable experience in water works design and operation defined analytical engineering as "nothing more nor less than good common sense scientifically applied." He also said that this "common sense" ingredient is most frequently supplied by practical plant operators. He might have added, however, that it is frequently the case that the consultant who views a particular situation from a greater distance can spot a deficiency with much more ease than can the individual who lives with a system.

Amongst the familiar sounding cases cited, wherein material operating losses had been spotted and corrected at appreciable savings, were the following: One case involved a centrifugal pump in practically new condition which had been purchased as a used pump. It operated perfectly, but unfortunately had the wrong characteristics for the duty. It was overpowered and also operating under a head lower than that for which designed. The result was a wire-to-water efficiency of only 25 per cent. Engineering advice at the time of contemplated purchase of this "bargain" pump would have prevented a mistake which had resulted in a continuing power waste. Another case was that of a small community rapidly going broke because of losses through its water works operation. The engineer uncovered the fact that 40 per cent of the water pumped was being lost through leakage. The plant operator would have quickly spotted these losses had the check meters recommended for selected points on the system been installed at an earlier time. In another case a town had actually defaulted on bond interest payments before engineering advice was sought. Amongst the several things found wrong was the fact that power cost for centrifugal pumping was just double what it should have been with the proper pump installation and tightening up of the leaky pipe system. Still another case was that revealing the need for pipe line cleaning in order to reduce the day in and day out power waste in pumping against the friction head created by the choked main.

In addition to the above commonly found defects and inefficiencies in pumping, it was brought out that an engineering diagnosis had often revealed the economy of providing added storage on the distribution system which would result in a more even pumping head and important power savings which can be had by pumping only during off-peak power rate periods of the day. Then too there was the question of rate revisions which the qualified engineer could point out the justification for in order to place the water system on a self-supporting basis.

Based on the case histories reviewed at the West Virginia meeting and others with which the writer is familiar, the following considerations appear to be in order. While municipal authorities have become thoroughly familiar with preventative medicine and its value to the community, these same authorities have as a rule completely failed to recognize the worth of "preventative engineering" to the municipality. While these same authorities take more or less for granted the need for periodical medical check-ups of the human system, they fail to recognize the potential value of an engineering check-up of the water works system at intervals. Also, they pay for the services of a City Attorney as a matter of course, but hardly ever give serious consideration to the matter of retaining a consulting engineer on an annual retainer to keep the water supply system or the sewerage system operating on a satisfactory and economically sound basis. The privately owned water utilities have in general followed this practice for many years and find that it pays.

Again we say that the question should not be whether the small municipality can afford to employ engineering advice periodically if not on an annual retainer basis; but rather, in the face of the record, can these smaller municipalities afford *not* to pay for engineering advice and guidance.

Incentive Rewards

It has long been our belief that municipally operated utilities could materially gain by instituting some form of incentive reward for employees.

Industrial plants have found that some form of special reward to employees making suggestions which are adopted by the plant management for securing an improved product, better working conditions, operating or maintenance savings, increased safety, improved public relations, increased man hour production, etc., has resulted not only in improved earnings but also in a better employee-employer relationship.

This incentive award system has also been adopted by the U. S. Navy and the War Department. The Navy reports that the $218,056 paid out to employees in prize money for suggestions has yielded $6,095,694 in actual savings during the year to the Navy. The War Department reports that during the past four years from 348,302 economy suggestions offered, 61,179 ideas were good enough to adopt. The prize money paid out for these ideas amounted to the neat sum of $1,856,167, but the resultant savings to the War Department has been a very much worthwhile $174,513,020.

There must already be a number of water or sewerage departments making such rewards but we know only of the system at Dallas, Tex., and the salary bonus system effectively (and legally) applied by the Waukesha, Wis., Water Commission. If the award system of Dallas, the bonus system at Waukesha, and the monetary award system of the U. S. Army and Navy are legal, then why not more in the nature of such Incentive Awards for municipally operated utilities? Will it pay? Just try it. If there are other municipal utilities employing incentive award systems, we will be more than pleased to hear about them.

L. H. Enslow

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"Hooker Liquid Chlorine" is a booklet which contains helpful information on this chemical and includes sections on materials for equipment, precautions, physical and chemical data and useful tables. Every water works and sewage official should have a copy. Available free when requested on your letterhead.

*"Results of Effluent Chlorination at Cleveland." Water Works and Sewerage, Aug., 1944, page 300.

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Of Water and Sewage Works, published monthly at Chicago, Ill., for Oct. 1, 1947.

State of Illinois, County of Cook, ss.—

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Edward S. Gillette, who, having been duly sworn according to law, deposes and says that he is the publisher of the Water and Sewage Works and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semiweekly or triweekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Edward S. Gillette, 22 West Maple St., Chicago 10, Ill.

Editor, L. H. Enslow, 155 East 44th St., New York 17, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is—. (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

EDWARD S. GILLETTE,
Publisher.

Sworn to and subscribed before me this 19th day of September, 1947.
(Seal)

KITTIE C. WOULFE,
Notary Public.
(My commission expires February 7th, 1950.)

MEETINGS SCHEDULED

NOV. 17-18—ROANOKE, VA.—(Hotel Roanoke)

Virginia Section A.W.W.A. Sec'y-Treas., W. H. Shewbridge, 708 State Office Bldg., Richmond, Va.

NOV. 19-21—WASHINGTON, D. C.—(Wardman Park Hotel)

Four States Section A.W.W.A. Sec'y-Treas., W. A. Welch, 748 Public Ledger Bldg., Philadelphia, Pa.

NOV. 20—BOSTON, MASS.—(Statler Hotel)

New England Water Works Assn. Sec'y, Jos. C. Knox, 609 Statler Bldg., Boston, Mass.

NOV. 20-22—ST. PETERSBURG, FLA.—(Suwannee Hotel)

Florida & Cuban Sections A.W.W.A. (Joint Meeting) Sec'y Fla. Section, A. P. Black, University of Florida, Gainesville, Fla., Sec'y Cuban Section, Laurence H. Daniel, Box 531, Havana, Cuba.

DEC. 10—WINTHROP, ME.

Maine Water Utilities. Sec'y Earle A. Tarr, Winthrop, Me.

DEC. 18—BOSTON, MASS.—(Statler Hotel)

New England Water Works Assn. Sec'y Jos. C. Knox, 609 Statler Bldg., Boston, Mass.

JAN. 20, 1948—NEW YORK, N. Y.—(Commodore Hotel)

New York Section A.W.W.A. (Winter Luncheon Meeting 1:00 P.M.) Sec'y-Treas., R. K. Blanchard, 50 West 50th St., New York, N. Y.

JAN. 21-24—NEW YORK, N. Y.—(Commodore Hotel)

American Society of Civil Engineers. Secretary, Col. Wm. Carey, 33 West 39th St., New York, N. Y. (Sanitary Engineering Division—Thursday, Jan. 22, A.M. & P.M.)

JAN. 23-24—NEW YORK, N. Y.—(Pennsylvania Hotel)

New York State Sewage Works Association. Secretary, A. F. Dappert, State Dept. of Health, Albany, N. Y.

Feb. 8-12—COLLEGE STATION, TEXAS

Texas Water Works & Sewerage Short School. Sec'y-Treas., V. M. Ehlers, 410 E. Fifth Street, Austin 2, Texas.

APR. 1-2—SYRACUSE, N. Y.—(Hotel Syracuse)

New York Section A.W.W.A. (Spring Meeting) Sec'y-Treas., R. K. Blanchard, 50 West 50th St., New York, N. Y.

APR. 5-8—ST. LOUIS, MO.—(Jefferson Hotel)

National Association of Corrosion Engineers. Exec.-Sec'y., A. B. Campbell, Southern Standard Building, Houston, Texas.

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Here and There with Doc Symons

H.T.M.A.—And this month I'm starting a series of pictures I took going to and at the San Francisco Conventions. If I snapped you, look for it here or in the next few issues.

* * *

Frank Roe, Chicago Pump's Eastern Manager, swears this actually happened in his home town in Illinois.—It was a small village with no more than one doctor, one lawyer, one dentist, one veterinarian, and so forth.

Picture then a summer afternoon and the local doctor starting to walk home. He'd passed the local undertaker's by a dozen steps when the latter came out of his office and started walking in the same direction as the doctor.

A block farther, still in their respective positions, a third man joined the procession proceeding down the main street. Each of the first two men were completely unaware of the person behind, and both were unaware that whenever the trio passed a person, the third man would point to the other two and say, "I'm going to get in on this case, too."—He was the local grave stone cutter.

* * *

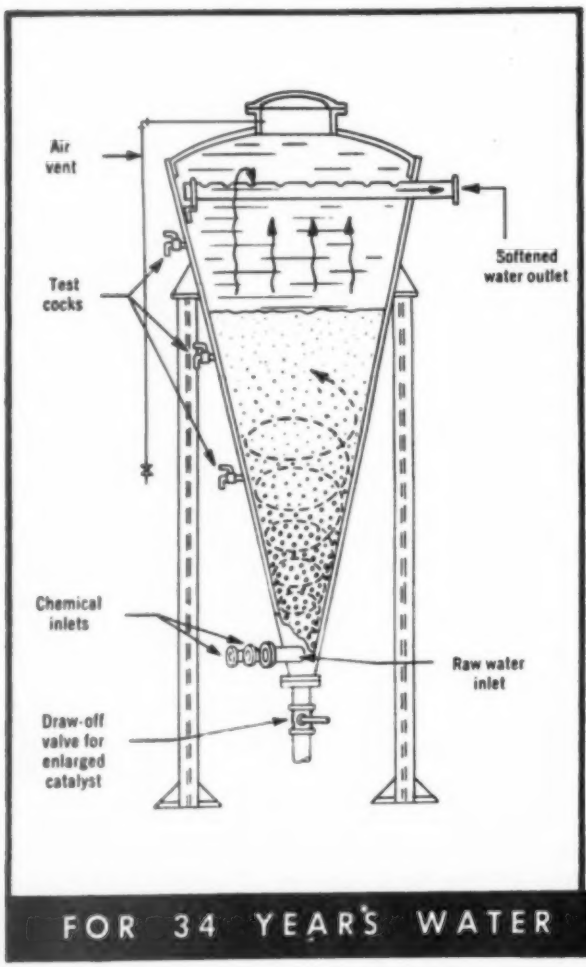
"There ain't no justice."—Some of us who fancy ourselves to be after-dinner speakers, often work a long time polishing a phrase to make it get a laugh, but all some fellows have to do is make a simple off-hand statement and it brings down the house. Take the case of W. H. (Pete) Wisely at the dinner of the Ohio Conf. on Sewage Treatment in Columbus last month. Pete, talking about his favorite topic, the Federation, said, "I mustn't take up too much of your time as there is *another* good speaker to follow me."—Now why can't I say funny things like that?

* * *

Hats off to:—Some time ago I wrote about sewer and water works boys being active in various other capacities. Well, hats off to four water and sewage works fellows on the Executive Committee of the Wisconsin Society of Professional Engineers; namely, *President*, Walter A. Pierce, Supt. of Water, Racine; *Second Vice President*, George Martin, Supt., Green Bay Metropolitan Sewerage District; *Secretary*, O. J. Muegge, State Bd. of Health, Madison; and *Treasurer*, Lloyd Schindler, City Engr. in Charge of Sewage Treatment, Appleton.

* * *

There's just one answer to (1) some of my friends in the Ohio Conf. on Sew. Treat. who wondered why I rushed away from their meeting almost before it started, to (2) my Canadian friends who wondered why I didn't show up at the C.I.S.S. meeting in Niagara Falls, Ont., and to



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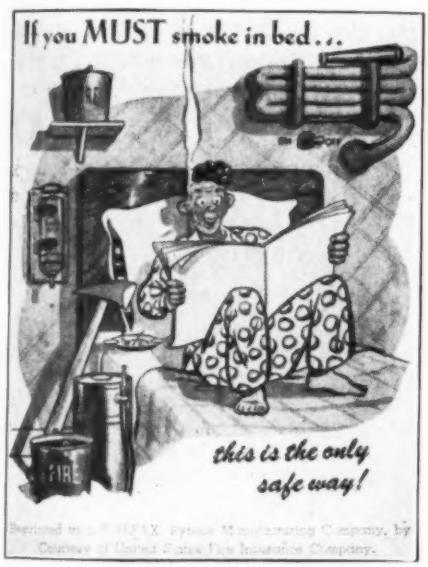
(3) you fellows in the N. J. Section A.W.W.A. who wondered why our son Jimmy Symons wasn't at Atlantic City taking pictures again this year. The answer: Jimmy had a bout with rheumatic fever, his second in two years, and it rather interrupted several plans. Glad to say that he's recuperating, although not up yet.

* * *

My colleague Jimmy (*Water & Sewage Works*) Angell quit smoking about three years ago and has been trying to reform all of his smoker friends since. Now, I quit smoking nearly ten years ago and I never tried to reform anyone—but, when a friend of mine showed me the accompanying cartoon, I thought it worth printing. All the more so because of the person who gave it to me—**Mrs.** Russ **(Smoke)** Clement of the W & T Smoke Clements. Wonder if she could have had an ulterior motive?



* * *

Do you remember in the August issue when I offered a free year's subscription to the first fellow to solve Sam (Elizabeth, N. J.) Newkirk's impossible puzzle (he got it from McWane Pipe) about how fast does a squirrel have to run from one end of a cage to the other in order to stick his head out of both ends at the same time.—Only reader who wrote in was that peer of North Carolinian engineers, that wonderful man from Durham, none other than Wm. M. (Bill) Piatt, who said the answer is "infinite or infinity, depending on how you state the problem."—Sorry Bill, that isn't the answer according to Sam. —Anyone else care to try it?

* * *

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For instance, our Rotary Positive units are widely used in separate or built-in applications where a small amount of air is required. For large volumes, you have the choice between Rotary Positive and Centrifugal Blowers, depending upon your specific requirements.

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TWO COATS...THIS THICK

THREE COATS...THIS THICK

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Three coats of Bitumastic #50 will cover metal, masonry or concrete surfaces with 1/16" of carefully refined heavy coal tar pitch, a protective shield with sufficient body to ward off corrosion from even the most active acids and fumes.

Each coat is equal to 8 coats of ordinary paint, but in spite of this thickness, Bitumastic #50 works easily and is applied readily with a brush. The refined coal tar pitch that forms its base is the most universally accepted protection against corrosive action.

There's a data sheet devoted exclusively to the subject of corrosion—proofing for Sewage Disposal Plants—ask for form 342. Address Wailes Dove-Hermiston, Westfield, N. J.

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Attention:—**Society of Council Bluffers.**—And anyone else who did or didn't make the trip to San Francisco. In the accompanying series of snapshots you will see, in the top row, scenes from our trip out: from left to right; Green River, Wyo. (not a soft drink); Wendell and Tina La Due (from Akron, you know); Three Gals in Cheyenne, Mary, Lil, and Dot (Van Atta, Saunders, and Jones, to be exact); A cold (ice) handshake of two past presidents of A.W.W.A. (Newkirk and La Due); and two cowboys (Dan and Jake) in for the rodeo at Cheyenne.

In the bottom strip, Prexy and Mrs. La Due preside over the A.W.W.A. 798 banqueteers.

* * *

C. M. Holt, Mgr. of Chlorine Sales of the Diamond Alkali Co., told this story at the Md.-Del. meeting in Washington. It isn't just a story, it is a verbatim report of one of Holt's salesmen and it goes like this:

"Today I was working the whistle stops between . . . and . . . and I stopped at the water plant in . . ., Iowa.

"Mr. Blank, the operator, was sunning himself outside the pump house and I asked him if they used chlorine. He said he got a tank last year but did not like it and sent it back.

"Mr. Blank said he stood the cylinder in the plant, opened the valve and tried to catch some chlorine in a dipper.—No luck! So he shut it off and let the air clear. Then, still with no idea that he was not going about the operation according to Hoyle, Mr. Blank laid the tank down flat on the floor and intended to try again. But before opening the valve this time, he decided to take the cylinder outside onto the lawn. He then proceeded to run liquid chlorine into a dipper and to carry it twenty feet and throw it into the tank of

water he wanted to chlorinate. He said it hit the water with a bang.

"I inquired whether or not he noticed any irritation of the eyes and lungs. Mr. Blank said he did not feel in first class shape for a couple of months.—The grass and flowers near where the experiment took place were dead. He, however, had managed to shut the valve.—I suppose the Lord just wasn't ready for him yet!"

* * *

And lest I forget, it was at the 9th annual meeting of the Ohio Sect. meeting in Columbus where everyone in the audience rose and applauded when Charlie Hoover (Supt. of Purif. at Columbus) came in. It was great to see Charlie up and around again, if only for a few minutes, and I personally shall always remember the thrill I received when Charlie Hoover paid me a very, very nice compliment. Thanks Charlie, may I tell my readers about it sometime?

* * *

And speaking of compliments—I had a letter from Mr. Gillette Publishing Co. (Mr. "H. P.," himself)—He liked my story of the San Francisco trip. **And** speaking of "H. P.," I suppose you readers noticed on page 383 of the October issue, that Mr. Gillette's Booklet on Cycles is soon to be published.—I've put in my order for one, have you?

* * *

The Lexicographer's Easy Chair: Clinton L. Bogert (N. Y. Consulting Engr.), my esteemed friend who has worked so hard on the soon to be published "Glossary of Water & Sewage Terms," has sent me the definition of a *sewer*. The information is taken from the 11th Ed. of the Encyclopedia Britannica and the Century dictionary, to wit; **"Sewer,** n.—an old name for a table attendant who placed and removed dishes from the table." Clint says, "try that on a waiter sometime."

* * *

More San. F. Conv.—There are a lot of stories I haven't yet told about the San Francisco Conventions and things that happened to me. F'rinstance, there was the thrill I had as I walked through the auditorium exhibits and overheard a stranger say, "There goes Doc Symons who writes that column." And then came the sudden shrinking of my ego back to near normal size, when the other man said, "Who the Hell is Doc Symons?"—It really happened.

* * *

Speaking of the Ohio Conf. on Sew. Treat., it missed only by one day of being held on the 80th birthday of J. W. Ellms, Commissioner of Sewage Treatment in Cleveland. Congrats J. W.!

* * *

It was at the beautiful Hotel Champlain, Plattsburg, N. Y., and the occasion was the after dinner address to the N. Y. Section by Tom Veatch, who as President of A.W.W.A. is aiming for the record of the shortest after-dinner talks in the history of A.W.W.A. Tom wound up his speech with these words, "On with the dance, let joy be unrefined." Tsk! tsk!, Tom, did you mean it?

* * *

Well folks, next month a story about Frank Behan of Plattsburg, N. Y., another about Fritz Friel, Mike Glace, and Dick Beckett, and more pictures of the S. F. trip, but right now I wonder what Fred (Kwik-Way) Stuart and Buffalo Bodie think of my new mustache. V. T. Y. Doc.

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20 GAL. STONEWEAR CROCK HOLE SANDBLAST TO TAKE 2" HOSE. CROCK THIS SIZE WILL HANDLE FEEDS UP TO 150 LBS. PER HOUR. LEAD OR WOOD BEFFEL IN FRONT OF OUTLET TO PREVENT SHORT CIRCUIT.
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APPROXIMATE COST FOR CONVERTING AVERAGE DRY FEEDER $25 TO $30
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THE SPILLWAY

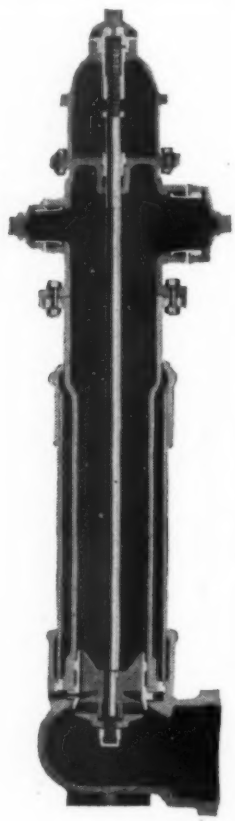
[Overflow from the main section]

Bibliography on Chemical Wastes

In this day of great interest in the abatement of industrial waste pollution of our streams, it is of particular interest to find that someone has taken the trouble to compile a "Bibliography on Chemical Wastes." This bibliography on "wastes from the chemical industry in relation to water pollution, 1937 to the present," was prepared by Dr. R. W. Hess, in charge of waste disposal, National Aniline Div., Allied Chem. & Dye Corp., Buffalo, N. Y.

Dr. Hess's bibliography was published in *Industrial and Engineering Chemistry*, Vol. 39, page 676, May, 1947. It has been limited in its scope "to the last ten years, since the beginning of this decade marks the start of nation-wide interest in industrial wastes in relation to water pollution. . . ."

The bibliography contains all the references on such subjects as water pollution and its control, water pollution and the law, organization for pollution control, reviews, regional problems, stream sanitation, toxicity of wastes to aquatic life, treatment of wastes, specific wastes, and analytical methods. A reprint of "Bibliography on Chemical Wastes" may be obtained by writing Dr. R. W. Hess, National Aniline Div., Allied Chem. and Dye Co., Buffalo, N. Y.



Once set, a Mathews Hydrant need never be dug up. All repairs can be done above ground—where they can be done fast and economically.

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Give your community the extra protection of Mathews Hydrants, first choice the world over for more than 75 years.

OTHER FEATURES OF MATHEWS LEADERSHIP

Head can be rotated a full circle, on swivel flange • Replaceable head permits change in nozzle outlets • Nozzle levels can be raised or lowered without excavating • True compression-type main valve • Operating thread (easily accessible) is only part that needs oiling • A modern barrel makes even the oldest Mathews good as new.

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The China Sanitary Engineering Service

A New Era in China

A group of sanitary engineers in America and China have organized The China Sanitary Engineering Service, Inc., as a non-profit organization, to bring to China modern sanitation, eliminate disease, and improve the business and living conditions in that country, as well as expand the export market for American goods and equipment.

Specifically the China Sanitary Engineering Service organization proposes to (a) promote, design, construct, and supervise the operation of waterworks and other sanitary facilities; (b) to represent standard American manufacturers and build up an efficient sales and service organization in the field; and (c) to use the proceeds from these services to support research and educational programs in sanitary engineering and public health.

The organizing office is under the management of John R. Snell. The organization is attempting to interest American businessmen and individuals in giving financial cooperation to set the organization on its feet. Individuals will benefit from the satisfaction of philanthropic endeavor, but American business will benefit by having the organization act as its representative in China.

The organization is to be made up of five main divisions; sales and promotion; engineering; construction; training, research and testing; and sanitation and public health. The first needs of the organization are an administration and engineering building in which there will be a research laboratory, chemical laboratory, material testing laboratory, and engineering and drafting offices, and a lecture room

for educating workers and the lay public in the matter of sanitation.

Financial requirements to set up the organization with its new buildings total $1,000,000, but it is expected that after the second year of operation the organization will be self-supporting. The program has the approval of many sanitary engineers in this country, educators, and manufacturers.

Individuals or equipment manufacturers who are interested in the possibilities of the future of this organization and desire to have further information should write to John R. Snell at 364 Lebanon St., Melrose, Mass. for a copy of the brochure and further information.

Water Supply and Sewerage —2nd Edition

Written by Ernest W. Steel, containing 666 pages, published by McGraw-Hill Book Co., New York 18, N. Y., and retailing for $6 a copy, the second edition of "Water Supply and Sewerage" has recently been issued. The first edition appeared in 1938.

The book covers these two mutually dependent fields and has been prepared principally with the student in mind. Part I deals with water supply and treatment, and Part II is devoted to the collection and treatment of sewage. Both parts have been expanded and brought up to date.

The water supply section has the latest discussion on the breakpoint process of chlorination as well as the 1942 U. S. Public Health Service drinking water standards; and the sewage section has new data and information on high rate trickling filters as well as information on sewage pumping and pump maintenance.

Typical examples of treatment processes and design methods are included to illustrate the theory presented. The book contains 30 chapters and two appendixes.

Northern Illinois Waterworks Institute

Because of the overcrowded condition of Northwestern Technological Institute, it was impossible to schedule a series of meetings for the Northern Illinois Water Works Institute as was done last year. Instead this year a one day meeting was held on Nov. 6th beginning at 1:30 p. m. Dinner followed the afternoon session and was held at the First Methodist Church in Evanston, Ill., after which a question box session was held.

The program consisted of lectures on the following: "Water Works Operation Is Big Business," by Louis R. Howson, Cons. Engr., Chicago; "Laboratory Control of Water Production," by Dr. M. Starr Nichols, Prof. of San. Chem., Univ. of Wis.; "Bacteriology in Water Treatment," by Dr. O. J. Eigsti, Prof. of Bact., Northwestern University; "Hydraulics of Distribution Systems and House," by Prof. Merrill B. Gamet, Assoc. Prof. Civ. Engr., Northwestern Univ.; "Problems in Deep Well Supplies and Pumping," by Prof. L. H. Kessler, Prof. San. Engr., Northwestern Univ.; and "Preventive Maintenance of Mechanical Equipment," by Jim Brower, Supt., Jones Island Plant, Milwaukee.

The board of experts for the question box session consisted of the above speakers plus C. W. Klassen, Ch. Engr., Ill. Dept. of Health, and was chairmaned by W. W. DeBerard, City Engr., Dept. of Pub. Wks., Chicago.

50th Anniversary—1897-1947

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"Ruggedly constructed . . . designed and developed to meet the maximum demands of the toughest job in sewage treatment . . . a unit of tremendous strength with proven ability under continuous heavy load duty" . . . that's the CARTER mechanism for fixed roof sludge digestion tanks.

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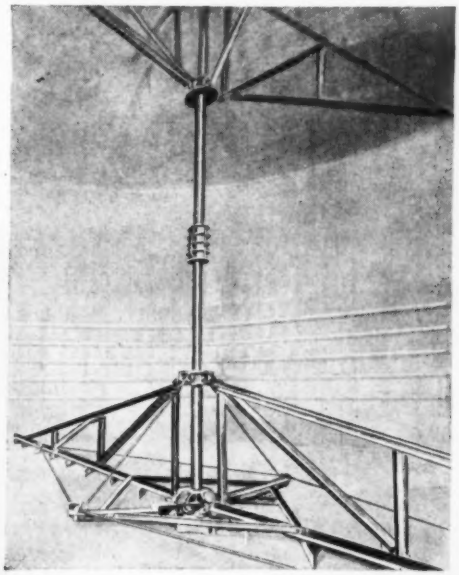

★ View at left shows interior of digestion tanks at the town of Tonowanda, N. Y., utilizing CARTER-45' diameter mechanisms.

We've placed the emphasis on TOUGH for this digester mechanism. Nowhere in the field will you find a unit for this service that measures up to CARTER standards. From drive mechanism to sludge sump scrapers, we designed to give you the best. Our literature describes in detail the constructional features . . . Write for it today.

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Third International Sanitary Engineering Conference in Santiago, Chile

The Inter-American Association of Sanitary Engineering and the Institute of Engineers of Chile are collaborating on arrangements for the third sanitary engineering conference to take place in Santiago, Chile, in April, 1948.

All sanitary engineers, civil and hydraulic engineers, sanitary chemists, public health officials, and others engaged in sanitation activities in the Western Hemisphere are invited to attend the meeting.

The program will include a number of technical papers on water supply, sewage treatment, malaria control, and rural sanitation. Manufacturers exhibits will also play a part at the conference, and one of the side trips will be Vina del Mar, the famous Chilean ocean resort.

The Chilean Conference Committee is headed by Ruperto Casanueva who is being assisted by Eduardo Aguirre S., Jorge Von Bennewitz, Luis Valenzuela, Adolfo Acevedo D., and J. Carter Hanes. U. S. participation in the conference is being coordinated by C. I. Sterling, Jr., Institute of Inter-American Affairs, Washington, D. C.

Further information may be secured by writing The Secretary, Inter-American Assoc. of Sanitary Engineering, N. W. Corner, 17th & Constitution Ave., Washington 6, D. C.

We're making a slight change...

● Effective November 1st, 1947, The Solvay Process Company and Solvay Sales Corporation have been merged into their parent company, Allied Chemical & Dye Corporation. The business of the merged companies will be continued under the name "THE SOLVAY PROCESS DIVISION, Allied Chemical & Dye Corporation" and "SOLVAY SALES DIVISION, Allied Chemical & Dye Corporation," respectively—with no change in personnel. Neither will there be any change in the traditional quality of Solvay products . . . nor in the dependable Solvay service which has been helping American industry for over sixty-six years.

● In other words, except for changing the lettering on the doors, our sales offices will continue as before at the addresses listed below.

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926 Midland Building	Cleveland 15, Ohio
7501 West Jefferson Ave.	Detroit 32, Mich.
921 Main Street	Houston 2, Texas
1107 Pere Marquette Bldg.	New Orleans 12, La.
43 Exchange Place	New York 5, N. Y.
12 South 12th Street	Philadelphia 7, Pa.
1107 Gulf Building	Pittsburgh 19, Pa.
3615 Olive Street	St. Louis 8, Mo.
Milton Avenue	Syracuse 1, N. Y.

SOLVAY

Do You Own and Use a Camera?

Cameras Can Quickly Pay for Themselves in Various Ways

Pictures are being used more than ever these days, and now that cameras are more and more common, good, and inexpensive, it almost behooves every person who can make good use of pictures to own and operate a camera. This applies to executives as well as to workers, mechanics, engineers and others.

After buying the camera, make it pay for itself. For instance, when something goes wrong with one of the machines in your plant—the furnace, boiler, engine, or what not—a snapshot may prove to be a real time and money saver. A photograph of the ailing part may describe it fully to the boss or to the manufacturer. The boss won't be obliged to come down to "take a look" and the manufacturer won't have to send an expert. The cost of the picture (materials only) may be no more than ten or fifteen cents, whereas the cost of an expert might run up to twenty, fifty, or even a hundred dollars or more.

Cameras are useful for keeping records. Thus before an alteration is made a picture of the part or thing can serve as a permanent record in the event any question should ever arise about it. And questions often do arise. Cameras are useful in a multitude of ways, all of which quickly suggest themselves as one goes along. One use in the water works business has been for meter reading—actually getting a picture record of readings.

The value of the camera was forcefully brought to the writer's attention in the case of an operator of an engine who found a crack in the cast brace holding the governor. He repaired the crack with strap patches, but as is often the case, the repair job was unsightly to the operator and he didn't like it. The stress in the casting was not great, but never-

theless the idea struck this operator that he could probably get a new casting if he could prove to the manufacturer at slight cost that the casting was defective. He did not want the manufacturer to go to too great trouble or expense over it.

So he took a picture of the patched job, the crack being still partly visible, and sent the picture to the manufacturer. Without questioning the operator, the manufacturer sent him a new casting free of cost.

Contributed by W. F. Schaphorst, M.E., Newark, N. J.

Conference on Municipal Garbage Refuse at Univ. of Mich.

The use of sewage treatment, landfill, incineration, and hogs as means of disposing of city garbage were among the subjects discussed during a conference on municipal garbage and refuse problems at the University of Michigan on Oct. 27-28. The meeting was held under the sponsorship of the School of Public Health at the University and chairmaned by Harry E. Miller, Resident Lecturer in Public Health Engineering and Sanitation.

The keynote talk was given by John Hepler, director of the bureau of engineering of the Mich. Dept. of Health, who spoke on "Public Responsibility for Control of the Health and Nuisance Considerations."

Other topics will include "Types of Collection," "Equipment, Disposal by Feeding to Hogs," "Incineration," and "Design," and "Disposal of Garbage with Sewage." The former topic, design, was discussed by Walter Drury, Cons. Engr., and George Wyllie, Supt., Lansing Sewage Treatment Plant, talked on operation of a sewage treatment plant handling garbage. "Sanitary Landfill" was the topic presented by Lewis Dodson, Dir., Public Health Practices, National Sanitation Foundation, Ann Arbor; and Earnest Boyce, Prof., Public Health Engineering, Univ. of Michigan, talked on "Factors Influencing Choice of Disposal Method for Refuse and Garbage."

Character of Water in North Carolina and Virginia

The U. S. Geological Survey at Raleigh, N. C., has published a report on the public surface-water supplies in North Carolina, giving a description and chemical character of the water. The book was prepared in cooperation with the North Carolina State Board of Health, Raleigh, N. C., contains 41 pages, and was authored by William L. Lamar, District Chemist, and Felix H. Pauszek.

The report gives information on 116 public surface-water supplies serving 139 communities in North Carolina. It may be obtained free from the Division of Sanitary Engineering, North Carolina State Board of Health, Raleigh, N. C., or from the U. S. Geological Survey.

Also available from the Division of Water Resources and Power of the Virginia Conservation Commission, Charlottesville, Va., is a 46 page book on the surface waters of Virginia, 1945-46. Written by William L. Lamar and George W. Whetstone of the Va. Conservation Commission and prepared in cooperation with the U. S. Geological Survey, the publication includes 497 complete analyses showing the chemical characteristics of surface waters in Virginia.

This report can be obtained free from the Div. of Water Resources and Power, Virginia Conservation Commission, P. O. Box 1338, University Sta., Charlottesville, Va.

SPECIFY Glauber
WATER LINE
CONNECTIONS
"They stand the
tests of time"
K-1420 — Inverted Key Curb Stop with loose tee handle. Round way, for copper service pipe both ends.
When Glauber water line connections are put into the ground, they are there to stay. Eliminate costly "opening up" for replacements by always specifying Glauber. For a lifetime of trouble-free operation you can't beat Glauber Red Brass ground key work.
K-1038 — Inverted Key Curb Stop with loose tee handle. Round way, inside iron pipe threads with top threaded for service box.
THE Glauber BRASS MFG. CO., KINSMAN, O.
Division of H. B. SALTER MFG. CO., Marysville, Ohio
Glauber RED BRASS
GROUND-KEY CURB and CORPORATION STOPS
LEAD GOOSENECKS and WATERWORKS FITTINGS

New "Well Handbook"

Being Published by Missouri Well Drillers Ass'n.

The Missouri Water Well Drillers Association announces the forthcoming publication of a "Water Well Handbook" containing nearly 200 pages of charts, tables, and other data pertinent to the drilling, testing, and operation of water wells.

All material in the book has been carefully selected to meet the needs of well drillers, engineers, geologists, and chemists who work with ground-water supplies. The book has been compiled and edited by Keith E. Anderson, Geologist and Engineer, Missouri Geological Survey and Water Resources.

Chapter headings are: Mathematical Formulae and Conversion Tables; Water Data; Cable Tool Drilling; Rotary Drilling; Pipe and Casing; Pumps; Electrical Data; Flow Measurement; Quality of Water; Hydrology and Geology of Wells; and Miscellaneous Data. The handbook will be bound with a flexible water and soil-resistant cover and the overall size (5½x8½ inches) makes it ideally suited for both office and field use.

The handbook will be ready for distribution within a short time and will be sold at cost, or approximately $1.50 per copy. Since only a limited edition will be printed, persons desiring copies should write immediately to the Missouri Water Well Drillers Association, Box 250, Rolla, Missouri, giving their name, mailing address, and the number of copies they wish to reserve. Persons making reservations will be notified as soon as the book is ready for mailing.

Ropp's Commercial Calculator

On page R-274 of the Reference & Data issue, July, 1947, of *Water & Sewage Works*, appears an article titled "Calculation of Areas, Volumes, Surfaces Reduced to Simple Terms." This article is concerned with mensuration, which is arithmetic applied to geometry determining the length of lines, the area of surfaces and the volume of solids and bodies. The footnote to the article states that the material has been drawn from "Ropp's Calculator."

A number of inquiries as to the publisher of Ropp's Calculator have reached us and we therefore take pleasure in reviewing this little book. Ropp's Commercial Calculator is now published by the Geographical Publishing Co., 621 S. Plymouth Court, Chicago 5, Ill. The Geographical Publishing Co. have taken over the plates, copyright, and good will of the Ropp publications and are publishing the calculator in three different editions at present—the desk edition listing at $2.00, the vest pocket deluxe keratol edition listing at $1.00, and the vest pocket red cloth edition at 75 cents.

Ropp's Commercial Calculator is a 192 page book which is published as "an improved ready reckoner and short-cut arithmetic—three labor-saving works combined." The book consists of "a comprehensive system of commercial tables covering a multitude of subjects designed for the use of mechanics, merchants, bankers, farmers, and dealers in all kinds of commodities." The book also contains "a review of the science of arithmetic so it is easily understood by anyone desiring to improve his educaticn in practical commercial arithmetic, mechanics, and mensuration." The book was first copyrighted in 1869 and has been revised and copyrighted many times since then.

The section on mathematics contains material on addition, subtrac-

HITCH ONTO REAL WORK-SAVING, TIME-SAVING ECONOMY

"FLEXIBLE CARRY-ALL" TRAILER

The complete, compact sewer cleaning tool on wheels. Built like a fire-fighting unit—ready to go on a moment's notice. Hitch it to pick-up or truck right now—it's already loaded. Leave men at the job, with everything they need on the trailer. Use the truck elsewhere. This is the kind of equipment that makes dollars-and-cents-saving sense!

The new "Flexible Carry-All" Trailer packs an entire "Flexible" rodding outfit—pipe guide, power drive, Ezy rod reel and stand, as well as hose, picks, shovels, rope and red flags. A large, locked tool box helps prevent loss or misplacement of hand tools. Hitch onto a work-saving, time-saving economy that pays off.

Have you seen the latest edition of Flexible's full line catalog? Write for your copy today.

FLEXIBLE SEWER-ROD EQUIPMENT CO.

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855 Board of Trade Bldg. Chicago 4, Ill.
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147 Hillside Ter. Irvington, N. J.
P. O. Box 165 Atlanta
1624 Harmon Place Minneapolis 3, Minn.
29 Cordan Ave. Roslindale 31, Mass.
P. O. Box 694 Pittsburgh
P. O. Box 447 Lancaster, Texas
41 Greenway St. Hamden, Conn.

tion, multiplication and division and short cuts to both, properties of numbers, cancellation, fractions, decimal fractions, ratio and proportion, longitude and latitude, percentage, interest, partial payment, discount, commissions, insurance, stocks and bonds, profit and loss, trade discount, exchange, partnerships, taxes, annuities, permutation and combination, powers and roots, and mensuration, as well as many other short cuts and commercial law.

The Geographical Publishing Co., in addition to Ropp's Calculator, publishes a plumbing manual, a heating manual, and also a book on steel square and its uses.

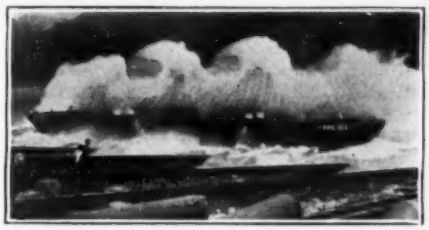
MANUFACTURERS' and EQUIPMENT NEWS

R. L. Hardman, Ch. Engr. Nat. Water Main Cleaning

The National Water Main Cleaning Co. has announced the appointment of Robert L. Hardman as Chief Engineer. Mr. Hardman has been associated with the company since Aug., 1946, following his separation from the service with the rank of Major, Corps of Engineers, U. S. Army.

A graduate of the University of Iowa in 1933, Mr. Hardman first worked on the Moffat Water Tunnel project, then went to the Panama Canal where for three years he was engaged in waterworks construction defense projects. This was followed by four years service in the Corps of Engineers as maintenance engineer of the Pacific side water system of the Panama Canal.

New Chlorine Barges for Columbia Chemicals



The accompanying photograph shows one of eight new chlorine tank barges, (the first ever specifically designed and built for such service) as it was launched into the Ohio River at Dravo Corporation's Neville Island Shipyard. These new tank barges are being built for the Columbia Chemicals Division of the Pittsburgh Plate Glass Co., and an affiliate, the Southern Alkali Corp. These barges will be used to effect more economical delivery of bulk chlorine to large users along the inland waterways.

"EASY DOES IT"

QUICKER — STRONGER, TOO . . .

Patent Applied For

with HAYS "DUO-STOP"

Combination Corporation Stop and Saddle for Cast Iron or Steel Pipe

It's quick . . . it's simple . . . it's safe. It's the corporation stop that water companies and municipalities have needed for a long time. Especially today, with the large scale housing projects and the demand they put on the service department, the Hays "Duo-Stop" is an important time-saver in making connections to small mains.

There's no interruption of service . . . there's no tapping of the main . . . there's no weak spot in the connection.

The "Duo-Stop" Combination Corporation Stop and Saddle is strong . . . stop and service clamp are of one-piece solid, rust-proof bronze . . . it is pressure-tight and leakless.

The Hays "Duo-Stop" is built to serve and built to last.

Write today for Folder 105

HAYS COPPER · BRASS · LEAD · IRON WATER WORKS PRODUCTS

HAYS MANUFACTURING CO., ERIE, PA.

New Deodorant

Here's something new under the sun. A deodorant that actually deodorizes and does not mask unpleasant or disagreeable odors. Hyamine 1622, manufactured by Rohm and Haas Co., Washington Square, Philadelphia, has the remarkable property of destroying odors when used in dilute solution. Hyamine 1622 is readily soluble in water and a solution of 1 to 2 per cent has been found to effectively eliminate odors in tanneries, slaughter houses, food factories, etc. Hyamine 1622 has absolutely no odor of its own. Experiments have shown that it will kill an onion or garlic odor.

Although the product has not yet been tried on sewage sludge, raw or digested, or elsewhere in sewage plants, we are of the firm belief that its reported success in destroying odors in tanneries and in exposed mud flats of a stream gives a good indication that it would be equally effective in destroying odors of screenings, grit, or putrescible sludge. If you wish to experiment with this new deodorant, write for further information.

PEERLESS

Builds the Pump You Require...in Vertical and Horizontal Types

CAPACITIES: 10 to 220,000 g.p.m.

DRIVES: ELECTRIC AND OTHER TYPES

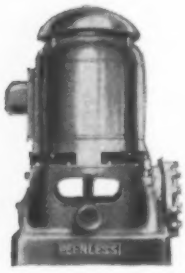
LIFTS: TO 1000 FEET

PEERLESS PUMPS

PEERLESS DEEP WELL VERTICAL TURBINE PUMPS

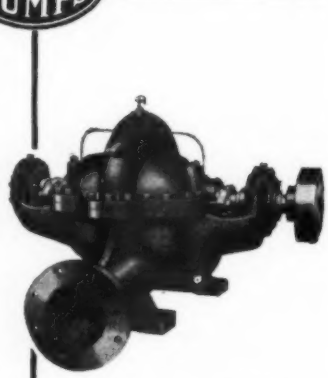
OIL OR WATER LUBRICATED TYPES

Peerless Vertical Turbine Pumps complement the extensive Peerless Centrifugal Pump line and are adaptable to the widest pumping conditions. Peerless' vertical type pump line includes turbine pumps, propeller and mixed flow pumps, Hi-Lift pumps and domestic water systems for deep or shallow wells. REQUEST BULLETIN.



Peerless Moturbo Drive illustrated

General Specifications: *Capacities*, from 15 to 30,000 g.p.m.; *Lifts*, to 1000 feet; *Drives*, electric, gear, belt or combinations. For wells 4" inside diameter and larger. Embodies patented Double-Bearing and Double-Seal Bowl construction.



PEERLESS TYPE A CENTRIFUGAL PUMP

General Specifications: *Capacities*, from 50 to 70,000 g.p.m.; *Heads*, 15 to 300 feet; *Sizes*, 2" to 42" discharge; *Drives*, electric and other types from 1 to 1000 h.p.; *Type*, single stage, double suction, split-case, ball bearing. REQUEST DESCRIPTIVE BULLETIN.

PLAN WITH PEERLESS

For all your pumping requirements, plan with Peerless. Peerless' comprehensive line of pumps includes Underwriters' approved Fire Pumps for plant fire protection, boiler feed and pipe line pumps and scores of vertical and horizontal types offering capacities from 10 to 220,000 g.p.m.

PEERLESS PUMP DIVISION

FOOD MACHINERY CORPORATION

Factories: Indianapolis, Ind. • Quincy, Ill. • Los Angeles 31, California

District Offices: Chicago 40, 4554 North Broadway; Philadelphia: Suburban Square, Ardmore, Pennsylvania; Atlanta: Rutland Bldg., Decatur Georgia; Dallas 1, Texas; Fresno, California; Los Angeles 31, California.

Vapor Recovery Reopens Tulsa Office

Appoints Houston Office Engineer

Frank V. Long, President, Vapor Recovery Systems Co. has announced that the company's Tulsa

W. H. Worsham

A. D. Scotty

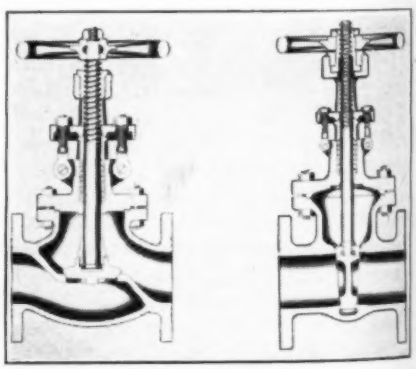
office at 533 Mayo Bldg. is being reopened. W. H. (Bill) Worsham, Jr. will be in charge of sales engineering in this area. During the war, Worsham, a graduate of Rice Institute, was an Engineering Officer in the U. S. Army Air Corps.

Angelo D. Scotty, Jr., has been appointed as Sales Engineer for the Vapor Recovery Systems Co. in Houston. He will assist John L. Shaunty, Houston Dist. Mgr. Mr. Scotty, a graduate of Rice Institute was a Navigator in the U. S. Army Air Corps.

Crane Announces Corrosion Resistant Valves

Two New Lines Added

Crane Co., 836 S. Michigan Ave., Chicago, has announced new lines of corrosion resistant alloy globe and

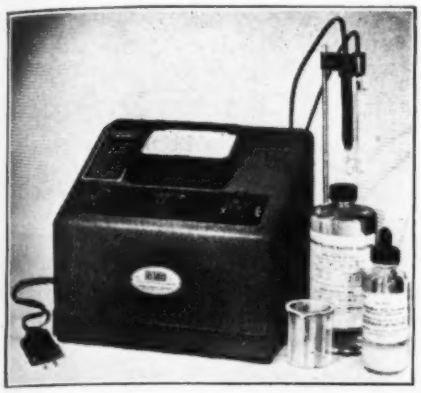


gate valves in sizes 2½, 3, 4 and 6 in. with flanged ends.

These new valves are designed for working pressures of 150 psi. liquid or gas, and working temperatures up to 350 deg. F. These valves were especially designed for installations handling chemicals and other corrosive materials. Write for further information.

Beckman Portable pH Meter

National Technical Laboratories, 820 Mission St., So. Pasadena, Calif., has announced a new portable Beckman Model H Meter which can be



plugged into any standard 110 v. 50/60 cycle AC line and can easily be transported from one location to another. The Model H covers the full scale of 0 to 14 pH and can be used for making millivolt readings within the range from 0 to plus or minus 410 millivolts.

Compact, light in weight, and with a wide versatility, this unit, which has built-in temperature compensation, has a reading accuracy of 0.03 pH and an accuracy in reading millivolts of 2. Detailed literature and information is available for the asking.

Permutit Opens Rochester Office

A. F. McCormack Heads Office as F. D. West Retires

Austin F. McCormack of the New York office of The Permutit Company has been named Sales Engineer

A. F. McCormack

F. D. West

in charge of the water conditioning firm's newly established Rochester office, according to an announcement by Permutit Vice President Daniel J. Saunders.

The new Rochester office replaces the one formerly located in Syracuse and now closed. This branch was directed by F. D. West, veteran Sales Engineer, who is retiring after 29 years of service with the company.

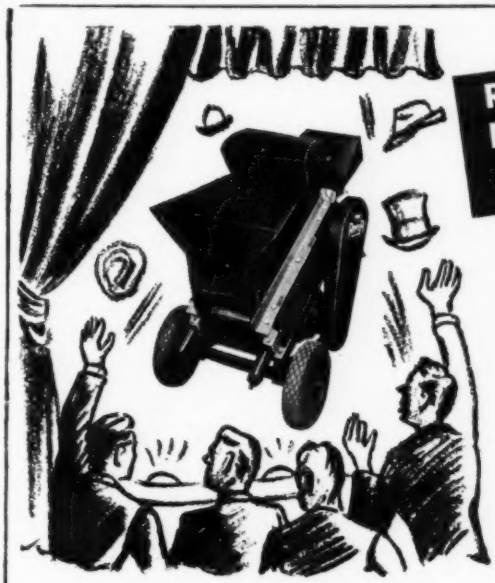
Mr. McCormack's territory will include roughly that portion of New York state lying west of Utica. The office is located in the Commerce Building, 119 Main Street, East, Rochester.

R. H. McLeod Joins Electro Rust-Proofing

Raymond H. McLeod, formerly of the Dow Chemical Co., has joined the technical staff of the Electro Rust-Proofing Corp. of Belleville, N. J. A graduate chemical engineer, and a veteran with two years service as an engineering officer in the U. S. Navy, Mr. McLeod will work with the engineering group in the company's Chicago office.

D. B. Hill, Dist. Engr. for Chain Belt

David B. Hill has been appointed district field engineer in the Atlanta office of Chain Belt Co., Milwaukee, Wisc. Previously Mr. Hill had been an application engineer in the company's Conveyor Division at Milwaukee. He joined the company in 1937.



ROYER SLUDGE DISINTEGRATOR *wins applause*

PLAYS DOUBLE ROLE IN COMMUNITY

1. **Solves your sewage sludge disposal problem.**
2. **Furnishes local florists, farmers, nursery men with source for valuable fertilizer.**

While giving you an easy and economical way of disposing of your sewage sludge (costs less than burning or carrying away to a fill) the Royer Sludge Disintegrator wins the praise of local florists, farmers and nursery men by giving them a valuable fertilizer rich in nitrogen, phosphoric acid and potash.

The Royer, with its fast moving sprig studded endless belt shreds, aerates, reduces moisture content, removes trash and discharges finished product into bag, truck, or pile. Only one or two men shovelling sludge from drying bed can produce from 1 to 12 cubic yards per hour. Many models to choose from — send for Sewage Sludge Datalog.

Royer NSB-4 at North Carolina plant delivers prepared sludge to trucks for delivery to parks and other users.

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA.

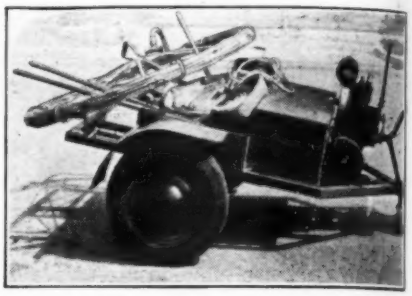
A. C. Pierce Joins Philadelphia Quartz

Albert C. Pierce has been added to the sales staff of the Philadelphia Quartz Co. and will assume territorial duties in the Metropolitan New York area. Mr. Pierce, a graduate in geology from the University of Pennsylvania in 1939 was a graduate assistant at Rutgers University until entering the Army Air Forces from which he was discharged as a Captain in 1946. Prior to joining the Philadelphia Quartz Co. in August of this year, Mr. Pierce was associated with the U. S. Geological Survey conducting an underground water survey in Maryland.

New Development in Screw Anchors

Anchoring of screws has been simplified and holding power increased and assured through the development of Sandscott Plastic Expanding Anchors by Holub Industries, Sycamore, Ill. These anchors may be used with wood screws or lag screws for fastening into any material. Made in seven popular sizes, this screw anchor has overlapping external and internal slits to give a "concertina" type expansion, and the anchors may be cut to the required length by pliers, knife, or saw. Maintenance shops in water and sewage works should find these new anchors of interest.

Sewer Cleaning Equipment on Trailer



A new type "Carry-All" trailer for sewer cleaning work, built like a fire-fighting unit, has been announced by Flexible Sewer-Rod Equipment Co., 9059 Venice Blvd., Los Angeles, Calif. The new Flexible Carry-All may be hitched to a car or truck and taken to regular or emergency jobs with no delay for loading. For further information write.

That's A Lot of Clay Pipe

The accompanying photograph is a story that needs no other words, except to say that W. E. Robinson, president of the Robinson Clay Product Co., is stamping the pipe with the company trade mark. This length of pipe and the huge production accomplishment it represents is the culmination of 91 years of operation by the company.

Permaflo Pipe

A & P Permaflo Pipe is a product made by the Pratt Industries, Inc. and distributed exclusively by the Albert Pipe Supply Co., Inc., of Brooklyn 11, New York.

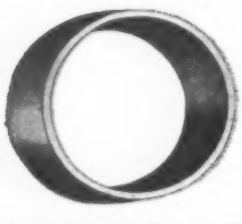
The tube is constructed of 22 gauge sheet, spirally locked around

A MIGHTY EXPENSIVE PIECE OF PIPE

in any water system

This piece of clogged pipe, taken from a water main, was the cause of high pumping costs, low pressures, and inadequate water supply.

Since 1906 National Water Main Cleaning Co. has corrected many serious pipeline conditions. These involved the removal of hard incrustation, serious tuberculation, obstructions, sediment and debris of all kinds in water mains of all types and sizes. Any main can be restored by National to at least 95% of its original capacity.



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NATIONAL WATER MAIN CLEANING COMPANY

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ATLANTA.....1221 Mortgage Guarantee Building
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CHICAGO.....205 West Wacker Drive
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MEMPHIS.....822 Dermon Building
OMAHA.....3812 Castellar Street
RICHMOND.....210 East Franklin Street
ST. LOUIS.....71037103 Dale Avenue
SALT LAKE CITY...149-151 W. Second South Street
SAN FRANCISCO.....681 Market Street
MONTREAL.....2028 Union Avenue
WACO.....P. O. Bo 887
WINNIPEG.....576 Wall Street
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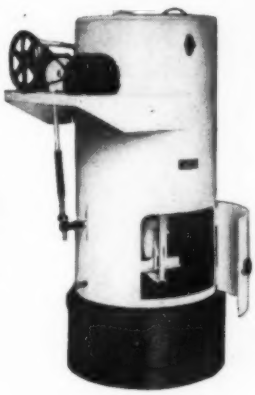
A SIMPLE, RUGGED FEEDER

OMEGA
UNIVERSAL

Whatever dry material you feed, the OMEGA Universal will handle it — dependably, accurately. Lumps or fine powder, light or heavy material — it makes no difference to this rugged volumetric feeder. The throat opening is large, and the unique design of the oscillating hopper prevents clogging and maintains feeding accuracy within 3% for most materials. A simple micrometer adjustment varies feeding rate over a range of 40 to 1. The Universal in three sizes covers a feeding range from 1 to 5,000 lbs. per hr. and is widely used for feeding lime, soda ash, alum, Ferrisul, etc. Extension hoppers, dust removers, lime slakers and other auxiliary equipment are available.

Write for Bulletin



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UNIVERSAL
FEEDER
with Mixing
Chamber

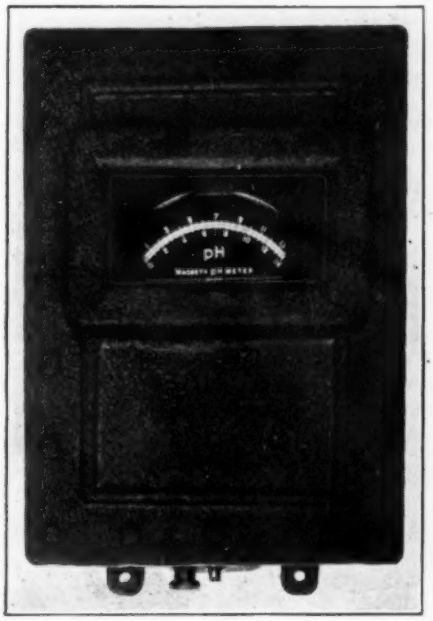
OTHER OMEGA PRODUCTS
Volumetric Solution Feeders • Gravimetric Dry Feeders • Lime Slaking Equipment • Bucket Elevators • Laboratory Stirrers

OMEGA MACHINE CO.
(Division of Builders Iron Foundry)
10 CODDING ST., PROVIDENCE 1, R. I.

OMEGA

the circumference. The lock seam gives the tubing sufficient flexibility to make it conform closely to the contour of the trench when laid. The gauge of the sheet from which it is constructed, accounts for the light weight of the finished product which results in so much time and labor saving. The tube can be manufactured in lengths up to 30 ft. It is coated with bituminastic enamel and then sprayed with a bituplastic coating, both of which are resistant to corrosive action of sewage. Further information is available on request.

Macbeth's New Explosion Proof Line Operated pH Meter



The Macbeth Corp., 227 West 17th St., New York 11, N. Y., has announced a new explosion proof, line operated, direct reading, continuous indicating pH meter, designed in accordance with Class 1, Group D, requirements for use in atmospheres containing gasoline, petroleum, ethyl alcohol, and acetone. The instrument is provided with a connection for operating a recorder at a remote position. Write for additional information.

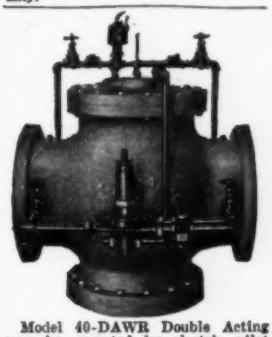
M. E. Routh Joins Foxboro at Shreveport

The Foxboro Co., of Foxboro, Mass., maker of instruments for measurement and control, has announced the appointment of Milton E. Routh as Manager of the Shreveport Office territory, succeeding E. A. Thomas, resigned.

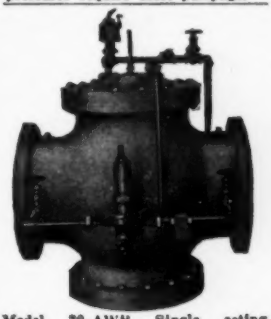
Est. 1879

ROSS
AUTOMATIC
VALVES

Altitude Valves for tank and reservoir, with two sets of controls—Automatic Hydraulic and Electric Remote Control. Hydraulic pilot normally operates the valve, while electric pilot is used for emergency only.



Model 40-DAWR Double Acting may be operated by electric pilot regardless of elevation of water in tank or reservoir, for a break in supply or distribution and when fire pressures require direct pumpage.



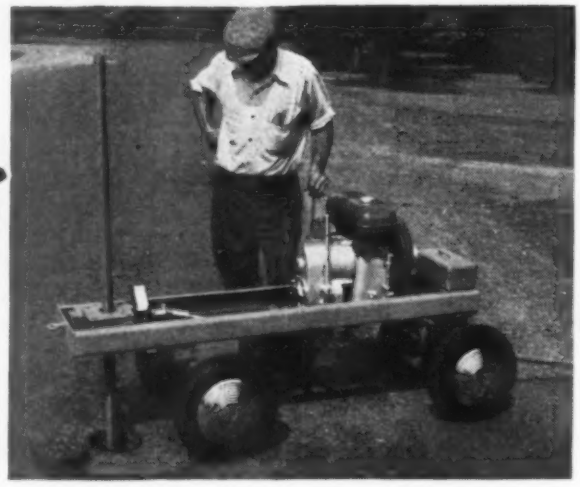
Model 30-AWR Single acting valve may be controlled in same manner as the Model 40-DAWR.

Model 40-AWR Single Acting semi-throttling valve will close on reversal of flow and the electric pilot would serve only a single purpose—either to open wide or close as emergency may require.

ROSS VALVE MFG. CO.
Incorporated
P.O. BOX 595, TROY, N.Y.

PAYNE DEAN GATE OPERATOR

NEW!



NEW!

SOMETHING NEW FOR QUICK OPERATION OF GATES TO 30 IN. A PORTABLE GAS ENGINE DRIVEN GATE OPERATOR•UNLOAD IT AT THE JOB AND LET THE TRUCK GO ABOUT ITS REGULAR BUSINESS. **ONE MAN** CAN HANDLE THE LITTLE FELLOW. 6 H.P. MOTOR. HUSKY, STRONG (450 LBS.) BIG TIRES AND BALL BEARING WHEELS FOR ROUGH GROUND. SAFETY SHEAR COUPLING•REVOLUTION COUNTER AND REVERSE GEAR. SPEED RANGE 15 TO 30 TURNS A MINUTE.

PAYNE DEAN & CO., MADISON, CONN.

Want any of these for your plant? Let us send you a sample of "N" Silicate with directions for activating by any of the processes listed below. Jar tests prove how N-Sol forms large, tough, heavy floc to aid coagulation.

N-SOL PROCESSES FOR WATER COAGULATION

Developed and Patented by

PHILADELPHIA QUARTZ COMPANY

LICENSE AVAILABLE WITHOUT CHARGE • PHILADELPHIA 6

N-Sol-A* — N Silicate reacted with ammonium sulfate. Used where chloramine sterilization is desired.

N-Sol-B — N Silicate reacted with alum. (U. S. Pat. 2310009)

N-Sol-C* — N Silicate reacted with Chlorine. The residual hypochlorite retains the same oxidizing powers produced by normal chlorine sterilization.

Baylis Sol — N Silicate reacted with sulphuric acid. (U. S. Pat. 2217466)

N-Sol-D — N Silicate reacted with sodium bicarbonate.

* Patent Applied For.

Stuart Corp. Expands Service to Water and Sewage Treatment Field

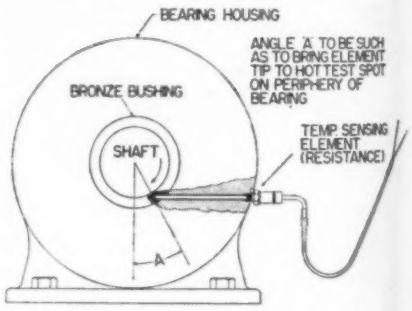
In our July issue the announcement appeared that the Stuart Corp., successor to Stuart-Brumley Corp. of Baltimore, was expanding its services and was acting as contractors of public work. In that same issue was a news item about the Hapman Conveyors self cleaning sludge tank, utilizing Hapman rub-

ber flight sealed pin conveyors. Now comes the news that Stuart Corp. has the exclusive territory for Hapman Conveyors south of the Pennsylvania-New Jersey line.

Fred Stuart, Pres. Stuart Corp. has also announced that his firm has been appointed exclusive southeastern sales representatives for the Hardinge Co., York, Penna., manufacturers of clarifiers, digesters, and the automatic backwash filter about which a literature item appears in our October issue.

New System Warns When Bearings Overheat

To warn when bearings start overheating is the function of a new automatic, multi-point bearing temperature monitoring system recently


BEARING HOUSING
ANGLE 'A' TO BE SUCH AS TO BRING ELEMENT TIP TO HOT TEST SPOT ON PERIPHERY OF BEARING
BRONZE BUSHING
SHAFT
TEMP SENSING ELEMENT (RESISTANCE)
A

which has been developed by the Instrument Division of Thomas A. Edison, Inc. The temperature of the bearing is checked every two minutes; if the temperature of any bearing exceeds an established maximum, an alarm is sounded. The overheated bearing is identified by an indicating lamp on the central control cabinet panel. By plugging in an appropriate

WILL SELL

1,000 tons Cast Iron Water Pipe 12" to 30" in diameter inclusive

ALSO

500 tons Water Fittings, various sizes from 4" to 30" in diameter

Phone, Wire, or Write —

Albert Pipe Supply Co., Inc.

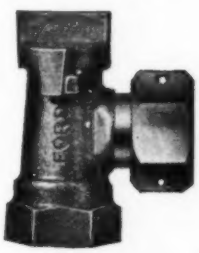
Berry and N. 13th St.

Brooklyn 11, N. Y.

EVERGREEN 7-8100

RINGSTYLE ANGLE VALVES

Inverted-key, precision-machined angle valves with meter coupling nuts attached. A most satisfactory valve for many types of outside and basement meter settings.



Ringstyle Meter Valves are made for meters from ⅝" to 1" in size and for connecting to either iron pipe or copper tubing.

Catalog and sample for the asking.

The FORD

METER BOX COMPANY, INC.

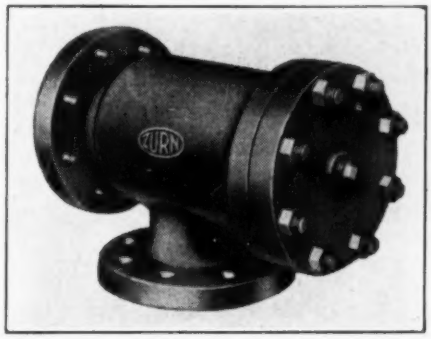
Wabash, Indiana

No. 4

jack the actual temperature of the bearing may be read on the panel. If the temperature reaches a second maximum before attention, the machine will be shut down. Write for further information.

Strainer with Angle Construction

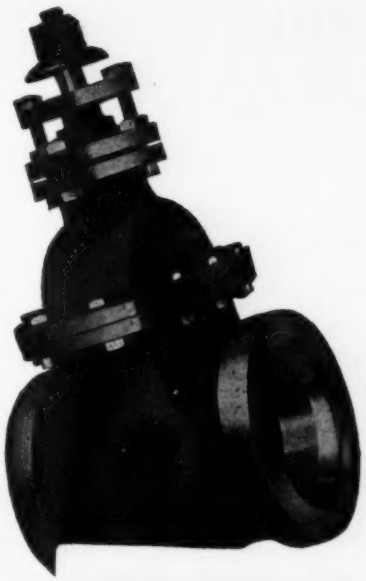
A strainer with an angle construction so that it may be installed directly upon the unit it is to protect



has been announced by the J. A. Zurn Mfg. Co. This unit can be installed on the original equipment it is to protect or at the time of installation of equipment. These strainers will find common use with pumping equipment and other close tolerance units. Various types are made with pressure ratings of 125, 150, 250, and 300 lb. Further information about these strainers shown in the accompanying sketch may be obtained on request.

Kinney Retires from Portland Cement Assn.

The Portland Cement Assn. has announced that Wm. M. Kinney, Vice President for Promotion, has requested permission to retire under the terms of the Association's retirement plan. Mr. Kinney has been connected with the portland cement industry nearly all of his business life. In 1918 he became general manager and secy. of the Portland Cement Assn., a position he held until 1931 when he was also elected as vice president of the association.



EDDY *Valves* and HYDRANTS

WILL THE MEN WHO FOLLOW YOU SAY YOU "KNEW YOUR STUFF"?

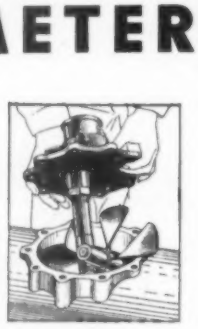
They will if you put in valves and hydrants now that will still be trouble-free in years to come. To be sure of this specify EDDY —when you buy. EDDY products have been built by men with three generations of specialized experience. Eddy products have served three generations of water works men exceptionally well. Buy the product you know you can depend on.

EDDY FOR LONG SERVICE

EDDY VALVE COMPANY

WATERFORD, NEW YORK

SPARLING MAIN-LINE METERS



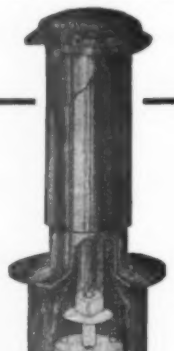
Accurate Measurement of Main-Line Flows

EFFICIENT operation of any water system demands accurate knowledge of how much water is going into distribution lines.

Bulletin 309 on request

The SPARLING Manufacturers of WATER MEASURING EQUIPMENT

LOS ANGELES - CHICAGO - CINCINNATI
NEW YORK - BOSTON



VALVE BOXES

- Fabricated from steel with Cast Iron Covers.
- Sliding adjustable.
- Easier to handle—no breakage.
- Ample Dimensions thruout.
- Heavy corrosion-proof coating.
- Early shipment.

LEE HYDRAULIC CO., TROY, N. Y.
297 RIVER STREET

Peerless Centrifugal Pumps for Chemicals

Incorporating a number of refinements in design to meet needs suggested by industrial users of pumps handling acids and caustics, the Peerless Pump Division, Food Machinery Corp., has developed a new centrifugal pump designated as Type ACO to help reduce costs of pumping corrosive fluids through ease of handling, prevention of corrosion to pump parts and lower unit maintenance.

Type ACO pump is a single stage, single suction type, equipped with ball bearings, and handles capacities up to 600 gpm. against heads up to 200 feet. The pump is described in Bulletin D-2400 issued by the Peerless Pump Division, Food Machinery Corp., 301 West Avenue 26, Los Angeles 31, Calif.

Protective Coating

Prufcoat Aluminum is an economical, all-purpose ready-mixed aluminum paint that stays bright for a long period under many adverse conditions. This material, now available for general maintenance painting, consists of a corrosion-proof, synthetic resin vehicle and a special aluminum powder that leafs very well. Each particle of

aluminum powder is encased in Prufcoat's special acid, alkali and water-proof synthetic resin vehicle.

The material can be satisfactorily applied to any general maintenance surface that is dry and reasonably free of rust and foreign material such as oil, grease, tar, and asphalt. The resultant Prufcoat Aluminum coating, in addition to sealing-in all average surface conditions, keeps all moisture and other corrosive agents from reaching the surface. Prufcoat Aluminum air-dries in a matter of minutes and comes ready-mixed.

For further information on Prufcoat Aluminum, write Prufcoat Laboratories, Inc., 63 Main St., Cambridge, Mass.

How to Speed up Meter Cleaning

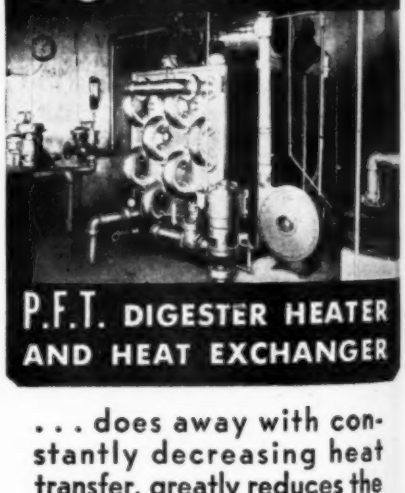
TO expedite meter repairs, first clean gear trains and other meter parts with OAKITE. This fast-acting emulsifier lifts off all muck and grease. Next, apply Oakite Compound No. 32 to remove lime scale quickly, thoroughly. Then, rinse. Parts come out clean, ready for repair . . . easy to reassemble.

Reconditioning meters this effective Oakite way is fast, easy. Saves hours usually spent on scratch brushing. OAKITE is available in unlimited quantities. FREE data gives further information. Write.

OAKITE PRODUCTS, INC.
73 Thames Street, NEW YORK 6, N. Y.
Technical Representatives in Principal Cities of U. S. & Canada

OAKITE
Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

A Better Way of Heating Sludge Digestion Tanks



P.F.T. DIGESTER HEATER AND HEAT EXCHANGER

. . . does away with constantly decreasing heat transfer, greatly reduces the labor of cleaning coils, and minimizes the operating interruptions encountered in the conventional method of heating digestion tanks. Ask for Bulletin 135.

P.F.T. PACIFIC FLUSH TANK CO.
4241 RAVENSWOOD AVE., CHICAGO
NEW YORK • CHARLOTTE, N. C.
SAN FRANCISCO • LOS ANGELES

Wood Preservative Paint

A new wood preservative paint, known as Woodtrem, has been developed by Speco, Inc., Cleveland. Especially adapted for wood that is to be buried in the ground or laid on the earth's surface, Woodtrem has a creosote content which kills bacteria causing rot. Woodtrem is available in black and aluminum. Further information may be obtained on request.

Clayton Appoints Orsborn for Kerrick Kleaner

J. A. Cortright, general sales manager of the Clayton Manufacturing Co. of El Monte, Calif., has announced the appointment of Alan G. Orsborn as his assistant in charge of sales promotion for the Kerrick Kleaner, Clayton Vehicle Analyzer, and Clayton Steam Generator divisions.

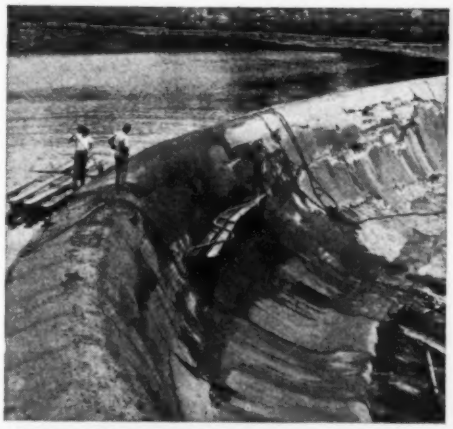
Pentrate Makes Water Wetter

Pentrate, the new product of American LaFrance Foamite Corp. of Elmira, N. Y. actually makes water wetter. Adding 1 per cent of Pentrate to water reduces its surface tension and thereby makes globules spread out and cover more surface area, and it increases the penetrating power of water. This characteristic makes it doubly helpful when applied to smouldering deep seated fires. Pentrate is noncorrosive. Additional information is available upon request.

Combination Scoop Dump and Lift Truck

A combination scoop dump and lift truck can be used to advantage wherever wheelbarrow sized batches must be transported. Principal advantages of the truck are: It saves labor; it saves time; and it is versatile and mechanically picks up and dumps from various levels. The truck is by Yale. Further information is available on request.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



DAM REPAIRED WITH "GUNITE"

The two photographs show the Bulls Bridge Dam of the Connecticut Light and Power Company, which is one of many dams we have repaired for this Company.

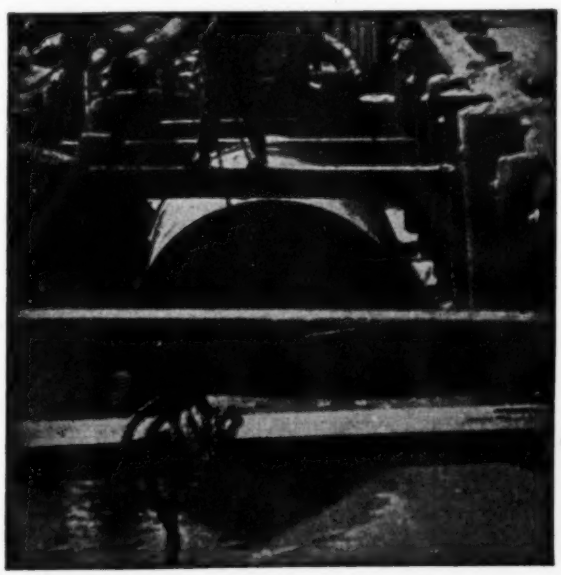
The upper view shows the work in progress, and gives some idea of the condition of this structure before repairs were made. The lower view is of the completed job.

After chipping out the loose and disintegrated concrete and sandblasting the entire area, heavy reinforcing mesh was placed over the surface of the old concrete and "GUNITE" applied two inches thick, plus the material required for filling deeply eroded portions.

Our 72-page bulletin C-2300 describes scores of similar "GUNITE" jobs.

Write today for bulletin A2300.

MANUFACTURERS OF THE "CEMENT GUN"



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 3" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

G. E. Conn Heads New Allis Chalmers Branch

G. Edward Conn, Jr. has been named manager of the newly established branch office at York, Penna. of the Allis-Chalmers Co. according to an announcement by the company. An employee of the company since 1940 and since April, 1943, a salesman in the Philadelphia office, Mr. Conn will be assisted by MacGregor G. Jones, former resident representative at the Harrisburg office which has been discontinued.

Carborundum Purchases Bell Aircraft Plant

The Carborundum Co. of Niagara Falls, N. Y., has purchased from the War Assets Adm., the plant operated during the war by the Bell Aircraft Corp. The building will be converted to the paper and cloth finishing department, as a part of the expansion program of the coated abrasives division of the company.

Gardner-Denver Opens New Branches

The Gardner-Denver Co. has announced the opening of three new branch offices to be located in New Orleans, Cleveland, and Kansas City. The New Orleans Branch at 1034 Camp St., will be under the direction of M. B. Morrisette. R. A. Williams will manage the Cleveland office at 8015 Carnegie Ave., and E. C. Wallace will manage the Kansas City office at 2805 Main St.

Another Enterprise Office in the Midwest

The Diesel Engine Division of the Enterprise Engine and Foundry Co. has established a sales and service branch office in Omaha, Neb. This new office at 1909 Leavenworth St., will be under the management of Glenn Harris, who was formerly attached to the home sales office in San Francisco.

Hooker Adds to Sales Staff in N. Y.

John M. Glaze has been transferred to the New York sales office of the Hooker Electrochemical Co. During the past year he has been associated with the sales department of the home office in Niagara Falls, N. Y. A graduate chemist of Dartmouth, Mr. Glaze joined Hooker in 1942 as a research process foreman. His territory will include portions of the metropolitan area in both New York and Northern New Jersey.

Rahiya Represents Liquon in Louisville

Liquid Conditioning Corp. of Linden, N. J., manufacturers of Liquon equipment and Liquonex materials for all water softening and clarification processes and for conditioning of other liquids, has announced the appointment of M. J. Rahiya as its engineering sales and service representative in Louisville, Ky. The Rahiya organization has recently moved its offices to larger quarters at 1111 Heyburn Building, Louisville 2, Ky.

LUMETRON

Photoelectric Colorimeter Model 450 for Nessler Tubes

A new photoelectric instrument of high accuracy for the measurement of color and turbidity, as well as for all analytical colorimetric tests in the examination of water and sewage.

- Turbidity tests in terms of APHA (ppm) scale.
- Color tests in terms of APHA (mg Pt) scale.
- Suited for determination of ammonia nitrogen, nitrate, nitrite, and for all other colorimetric tests according to APHA "Standard Methods."
- Operates with all "low form" Nessler tubes 32 mm O.D., 200 mm high. Requires no matched sets of tubes.

LUMETRON Mod. 450 eliminates the uncertainties of visual matching methods. It requires no permanent color standards and furnishes reproducible results independent of individual judgment and of light conditions.

Write for literature to

PHOTOVOLT CORP.

95 Madison Ave. New York 16, N. Y.

Write also for literature on

PHOTOVOLT Line-Operated pH METER

POSITION WANTED

BACKGROUND OF ENGINEERING TRAINING AND EXPERIENCE, BUSINESS, MANAGEMENT, SALES AND PROMOTION, ADVERTISING, DEVELOPMENT AND INVENTION AVAILABLE IN ONE MAN—

Age, 46; 5 ft. 9 in.; weight 168 lbs.—Active physically and mentally. Adaptable, aggressive, hard worker.
Married. One son, Sophomore at Northwestern University. One daughter, Sophomore at North Park Academy.
Special skills are invention, development of new uses and applications for existing products, and improvement of same; mass sales promotion and national advertising planning, creating and managing sales agency organizations, executive and management work of widely varied type and scope including office, shop and field phases.
Have 1947 Nash Ambassador automobile for business use.
Available immediately on either temporary or long-term contract, preferably with Chicago headquarters. Not averse to travel within reason.
Past experience includes the following:
1922, June, B.S. in M.E., Armour Institute of Technology (now Illinois Tech.)
1922, June to 1924, Sept.—2½ years—sales, advertising and executive work on technical publication serving railroad and industrial fields.
1924, Sept. to 1925, June—9 mos. Post-Graduate Course in L. A. & S. and Engineering Schools, Univ. of Illinois.
1925, June to 1926, Sept.—1¼ years—estimating, service and sales on high pressure water tube boilers in large Chicago buildings.
1926, Sept. to 1927, Jan.—1-1/3 years—employed by Consulting Engineering firm as Junior Engineer on time-studies and production planning, surveys, reports, etc. in industry.
1927, Jan. to 1929, Nov.—2 years—Manager of Sales, Stoker Division, initiating nationwide sales and service organization.
1929, Nov. to 1932, March—3-1/3 years—service, installation and sales proportioning equipment for treatment processes in oil refineries calling on major oil refiners in ten central states, from Chicago office district headquarters.
1932, Mar. to 1933, Sept.—1½ years—founded successful firm in water works equipment field and invented and patented chemical feed pumps and installed same in railroad, industrial and municipal service.
1933, Sept. to 1947, July—14 years—formed corporation—was largely responsible for building up sales from "scratch" to a leading position in chemical feeder field, with 1942 volume attaining 1½ million dollar sales. Active in all phases of organization work, design, installation, service, correspondence, sales, production, expediting, management, advertising, planning and executive work, government contracts, etc. Nine of these years in employ of one firm.
Reference as to character, past business relationships and financial reputation upon request.

Box 112—Water & Sewage Wks.
22 W. Maple St., Chicago 10, Ill.

The SEWER SCOOTER

(U. S. Patent 2,198,823)

THE ONLY 100% SELF-PROPELLING SEWER CLEANER

SEWER SCOOTER MODEL A-3, BRONZE

THE FLUSHING ACTION IS APPLIED BY COLLAPSING THE SHIELD.

A patented feature

No Preliminary Work — Gets Results in a Hurry

Standard machines stocked 8 inches to 96 inches—For sale, rent or contract.

J. C. FITZGERALD

Box 289-A
Coral Gables 34, Fla.

LITERATURE AND CATALOGS

Lumi-Lens Colony Counter

A new, modern design, Lumi-Lens Colony Counter has been announced by Fish-Schurman Corp., 230 E. 45th St., New York 17, N. Y. This new design is 11 inches wide, 6 inches deep and 7 inches high, has a magnification of 2.2, and utilizes two bulbs on each side for illumination, thereby insuring uniform light. The entire area of a 100 mm. petri dish may be examined at one time, and a special combination Wolffhuegel and Jeffer counting plate is available.

Universal Concrete Pipe Adds Two Engineers

Fred W. Morse and Fred W. Plapp, both of Worthington, Ohio, have joined the staff of the Universal Concrete Pipe Co. of Columbus, Ohio. Morse, formerly in the production control section of Curtis-Wright will be in the production engineering and control department of the pipe company. Plapp, a hydraulic machine designing engineer will be associated with the product design engineering division.

Clay Pipe Jointing

The Clay Sewer Pipe Assn., Inc., 1105 Huntington Bank Bldg., Columbus 15, Ohio, has issued a four page folder on **How to Get the Best Joints For Vitrified Clay Pipe.** Proper jointing of Vitrified Clay Pipe depends essentially upon careful workmanship. This folder shows eight pictures of important features of proper jointing procedures. Descriptive matter beside each illustration elaborates on these points.

The folder ends with this statement, "A tightly jointed sewer line should limit leakage or infiltration to not more than 500 gallons per mile of sewer each day for each inch of diameter. A few faulty joints will offset the advantage of many perfect ones." The folder is available for the asking.

Financing Sewage Works

The Portland Cement Assn., 33 W. Grand Ave., Chicago, Ill., has issued a booklet on **Sewage Treatment Works,** "Why Are They Necessary, What They Are, and How They Can Be Financed"?

This 24 page booklet begins with an explanation to the first question above, then proceeds to explain partial or primary treatment, secondary treatment, selection of site, etc. One section of the booklet is devoted to "How Sewage Works Are Financed," and this section includes material on the organization of a district, and methods of financing (four are given). Descriptions of treatment methods and units together with flow diagrams conclude this booklet which will be helpful to sewage works superintendents faced with a program of expansion, or city engineers faced with the construction of sewage works facilities. This booklet written so the layman can understand will help both sell their particular needs to the community or its governing body. Copies of this booklet are available on request.

VALVES AND FITTINGS

DEPENDABLE PERFORMANCE SINCE 1901

Iron Body Gate Valves
Iron Body Check Valves
Iron Body O.S.Y. Valves
Iron Comp. Flanges
Iron Flange Unions

"A" TRADE MARK

Brass Pipe Fittings
Brass Gate Valves
Brass Globe Valves
Brass Check Valves
Brass Radiator Valves
Brass Gas Cocks

AMERICAN VALVE MFG. CO. Coxsackie, N. Y.

N. Y. OFFICE & WAREHOUSE: 37-25 32ND ST., LONG ISLAND CITY 1, N. J.

HYDRO-TITE
JUST POUR
THAT'S ALL

Hydro-tite, the self-caulking, self-sealing, pipe-jointing compound, solidifies and hardens immediately without shrinkage. No caulking is necessary. Any slight seepage that may appear at first soon stops.

For over thirty years Hydro-tite has proved its ability to stand up under all conditions of strain, vibration and pressure. Send for data book and sample.

ALWAYS USE FIBREX

The sanitary, bacteria-free packing that costs about 30% less than braided jute. Send for sample.

HYDRAULIC DEVELOPMENT CORPORATION
Main Sales Office: 50 Church St., New York, N.Y.
Works: West Medford Station, Boston, Mass.

GOLDEN-ANDERSON
Design and Build
OVER 1500
TYPES AND SIZES IN
AUTOMATIC
VALVES
For Engineered Protection
on any HIGH PRESSURE
INSTALLATION

● Make Golden-Anderson Valves your first choice on any new or replacement project—for maximum safety, dependability and protection.

Descriptive Technical Catalog on request.

GA
GOLDEN-ANDERSON
VALVE Specialty Company
PITTSBURGH 22, PA

Float Switch

The standard **L-200 Float Switch** is a sturdy, two-pole double-break, snap-back float switch described in a one sheet release of the Automatic Control Co., 1005 University Ave., St. Paul 4, Minn.

Valves for Chlorine Service

In a double page spread folder, Crane Co. of Chicago, Ill., show their **Valves for Chlorine Service Exclusively.** Crane Chlorine Valves are made in globe and angle patterns, in six sizes from ½-in. to 2-in. All sizes in both types have screwed ends. The folder shows a cutaway drawing of the Crane design which is claimed to lengthen valve life. Further information on these valves is available on request.

ABC's of Wrought Iron

A 20 page illustrated booklet issued by A. M. Byers Co., Pittsburgh, has the fundamental title of **The ABC's of Wrought Iron.** Illustrated, the booklet tells in nontechnical terms what wrought iron is; why it resists corrosion and withstands shock and vibration; how it is made; how it is bent; welded, and threaded. The various services for which wrought iron pipe and plates are used in the industrial, railroad, sewage, water works and other fields are also depicted. The booklet is available for the asking.

Lubricating Manual

Containing lubrication specifications for all 1946 and 1947 passenger cars and light trucks, as well as for several models of prior years, the first **Alemite "RX" Lubrication Prescription Manual** issued since 1942 has been announced by the Alemite Division of Stewart-Warner Corporation.

An innovation in the new manual is a chart of lubrication point locations for each vehicle covered. Prior Alemite manuals had only one general chart at the front of the book. Another valuable feature is a chart of gas tank, crankcase, radiator and gear case capacities. Oil and grease viscosities, at various temperature ranges, are likewise given, according to car and truck manufacturers' recommendations.

Available to service outlets only through Alemite distributors, the

No point in jointing cast iron water mains with HIGH PRICED LEAD!

Switch to
Haymanite
JOINTING COMPOUND

● Saves 75% of costs
● Goes 4 times as far
● Eliminates caulking
● Needs no large bell holes
● Self-seals if broken

Once Haymanite is used for a bell and spigot cast iron water main installation, you'll never want to go back to lead or any other material. Aside from its tremendous cost-saving features, Haymanite is easily applied by any workman and requires fewer tools. Immediate shipment. FREE: Illustrated catalog.

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Alemite manual will be supplemented through a bulletin service to registered users when and as changes are made in lubrication prescribed by automotive manufacturers.

Filter Bottoms

Builders-Providence, of Providence, R. I., in Tech. Bull. No. D4-700.21 presents engineering information of the **Wheeler Filter Bottom.** This is the Monolithic Type constructed with Builders prefabricated forms. The bulletin describes the Wheeler Filter Bottom, its operation, its design advantages, cost, construction, and gives typical specifications. If you want to know more about this bottom write for information.

Oil Separators

Gale Oil Separator Co., Inc., 52 Vanderbilt Ave., New York 17, N. Y., has issued an interesting eight page folder, on the front of which is shown **The Lake at Willow Run.** Inside are shown pictures of the construction of Gale Oil Separators at the famous Willow Run plant. Other pictures in the folder show the installation of Gale Oil Separators at many other industrial establishments, including many railroad shops. These Gale Separators "intercept and separate dirt, cinders, ash, oil and grease from water and eliminate pollution." Further information on the oil separators may be obtained by writing for it.

Sewer Cleaning Equipment

A new 36-page edition of the **Municipal - Industrial Catalog** is now available from the Flexible Sewer-Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif. The catalog carries a full description of the company's sewer and pipe cleaning tools, including the compact "Carry-All" trailer and the improved "Flexible" Power Bucket machines. The catalog is distributed on request.

Acidizing Water Wells

According to Dowell, Inc., subsidiary of the Dow Chemical Co., Midland, Mich., **Acidizing Improves Water Wells,** a two page sheet from the *Dowell Acidizer,* Vol. 9, No. 6, explains why and how; it is available on request.

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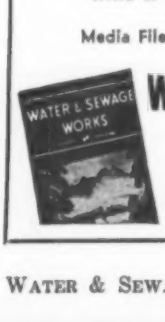

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The **Waste King Food Pulverator** is presented and described in a bulletin issued by the Given Mfg. Co., 3855 Santa Fe Ave., Los Angeles 11, Calif.

The bulletin describes the new unit, shows by photographs how it is to be operated, and presents a cutaway drawing showing the mechanism.

According to the bulletin, this unit is easily installed in kitchen sinks with a sink drain opening of 3½ to 4 in. in diameter.

Diaphragm Valves

Grinnell Co., 260 W. Exchange St., Providence 1, R. I., has issued Catalog 2-S on the **Grinnell-Saunders Diaphragm Valves** for corrosive liquids, gases, and slurries. This bulletin contains information on the features and advantages of handwheel operated, piston operated, and quick operating valves. Body and diaphragm recommendations for corrosive liquids and gases are given. These are the types of valves that find useful application in water and sewage works for controlling flow of sludge, lime slurry, ferric chloride, and other chemicals. The bulletin is available on request.

Concrete Pipe Data

Results of a survey on concrete pipe load supporting capacity under minimum cover conditions have been published by the American Concrete Pipe Assn. in **Bulletin No. 73.**

The bulletin is a report of a series of full-scale tests under normal field conditions, and it details the behavior of concrete pipe when it is laid close to the surface of the ground and subjected to heavy loads applied over a limited area.

Bulletin 73 is available to Association members at 10 cents per copy.

Corrosion in Well Pumps

Circular 24, issued by the State Water Survey Division of the Illinois Dept. of Reg. and Educ. at Urbana, Ill., is a reprint of an article by T. E. Larson, Chemist. Titled **Corrosion in Vertical Turbine Pumps,** the article originally appeared in *Water & Sewage Works,* Vol. 94, April, 1947. This circular is available on request.

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Well Rehabilitation

In Circular 23, issued by the State Water Survey Division of the Department of Registration and Education of the State of Illinois, J. B. Millis has written on the **Rehabilitation of Sandstone Wells.** This circular is a reprint of an article by that title published by the author in the *Jour. of the A.W.W.A.*, Vol. 38, p. 11, (1946). The discussions by Carl Duy of Aurora, Ill. and Edward Wilson of the Corn Products Co., Argo, Ill. are included. The bulletin is available on request.

Controlling Filter Flies

%Proportioneers, Inc.%, 9 N. Codding St., Providence, R. I., has issued a special report on controlling filter flies with DDT emulsion. This report is titled **Control of Filter Flies by Application of DDT Emulsion to Trickling Filters** and the report covers work done on this method of control during 1946. It will be of interest to all plant operators troubled with filter flies.

The report also discusses methods used in the past such as flooding, gasoline torches, special chemicals, and chlorination, and results from two experiments conducted in 1946 where DDT emulsion was used, are also described. Reference is likewise made to work done by army investigators and the results are correlated in the summary of the report.

The report is available on request.

Portable Generators

Homelite Corp. of Port Chester, N. Y., has a four-page bulletin on Homelite Portable Gasoline-Engine-Driven Generators. The folder shows the many and varied uses of this portable power, including emergency floodlights, operation of electric tools, etc.

A cutaway drawing shows the "inside story" of the Homelite Generator's portability and long life.

The company invites requests for demonstrations.

Alkalies and Chlorine in Water Treatment

A new technical bulletin, by the Solvay Technical and Engineering Service, is being offered to chemists and engineers responsible for water supply problems in industrial plants, water supply departments, power stations, and ice manufacturing plants. This bulletin, Bulletin 8, 3rd Ed., is titled **Alkalies and Chlorine in the Treatment of Municipal and Industrial Water.** Containing 94 pages, Bulletin 8 has sections on softening, purification, tastes and odor removal, corrosion control, boiler feed water treatment, the use of alkalies, chlorine and other chemicals and equipment, as well as lists of standard reference works on many of the subjects covered. The book may be obtained on request to the Advertising and Sales Promotion Dept. of Solvay Sales Corp., 40 Rector St., New York 6, N. Y.

Pneumatic Control Valves

A new 36-page Bulletin 277-2, **Pneumatic Control Valves and Controller Accessories,** has been issued in a new edition by the Foxboro Co., Foxboro, Mass. Copies will be mailed on request.

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Surge Suppressors

In Bulletin No. 31 titled **Pelton Surge Suppressors**, the Pelton Water Wheel Co. of 2929 19th St., San Francisco, presents a device designed to eliminate water hammer on flow lines.

The objects of the bulletin are first to point out briefly the conditions in typical flow lines wherein relief from surge is imperative, and to show by actual test records how such relief has been obtained; and secondly to reveal the fundamental design and construction details which have made the Pelton surge suppressor a success. The operating sequence is explained and the approved method of installation is illustrated and described.

Protective Coatings

Wailes Dove-Hermiston Dept. of Koppers Co. has published a 26-page bulletin on **Bitumastic Protective Coatings.** Complete with pictures, this bulletin presents the many Bitumastic products, particularly those used to protect water and sewer lines, gas, oil, and gasoline pipe lines, ships, and other structures, among other uses. The bulletin concludes with a Coating Guide for the selection of both hot and cold applied coatings. This bulletin is available on request.

Corrosion Resisting Equipment

The Duriron Co., Inc., Dayton 1, Ohio, has issued several bulletins on (1) **Corrosion Resisting Process Equipment** (General Catalog J), (2) **Acid Proof Duriron for Corrosive Waste Disposal Systems** (Bull. 703), and (3) **Durco Corrosion Resisting Alloys** (Bull. 100). The first (General Cat. J) gives a brief description of every type of corrosion resistant equipment produced by the company; the second (Bull. 703) is a complete 12 page manual on the corrosion resistance, proper installation, and use of Duriron acid proof sinks, sink strainers, traps, and sanitary pipe and fittings; the third (Bull. 100) is a "Guide to the selection of Durco Resisting Alloys" and lists 155 corrosives in alphabetical order and shows which of the five Durco alloys offers most satisfactory resistance to each corrosive. Any of these bulletins may be obtained by writing for them.

Employee Depreciation

In a booklet titled **How to Avoid Losses from Employee Depreciation,** Guy S. Burtis, 1 N. LaSalle St., Chicago 2, Ill., presents an idea of how a retirement pension plan can be used as a potent factor in building up satisfactory employee-employer relations, and at the same time assure new blood to the industry and the proper retirement of superannuated employees at a definite age. This gives better opportunities for advancement and has a number of other advantages.

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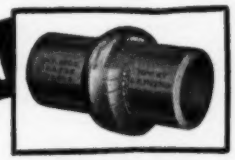
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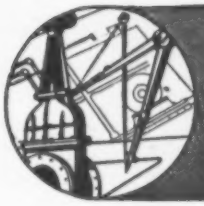

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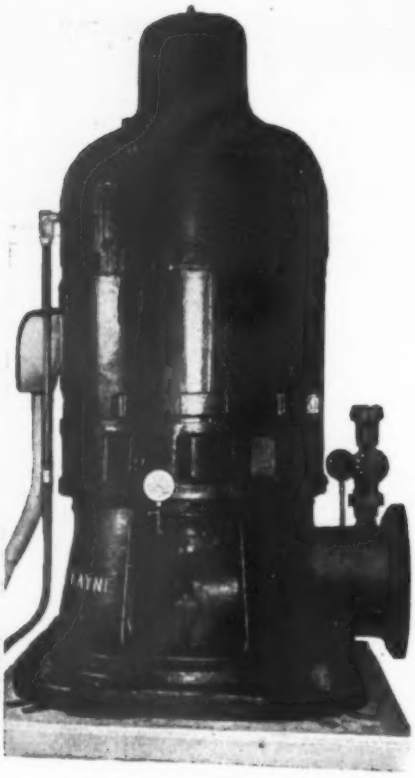

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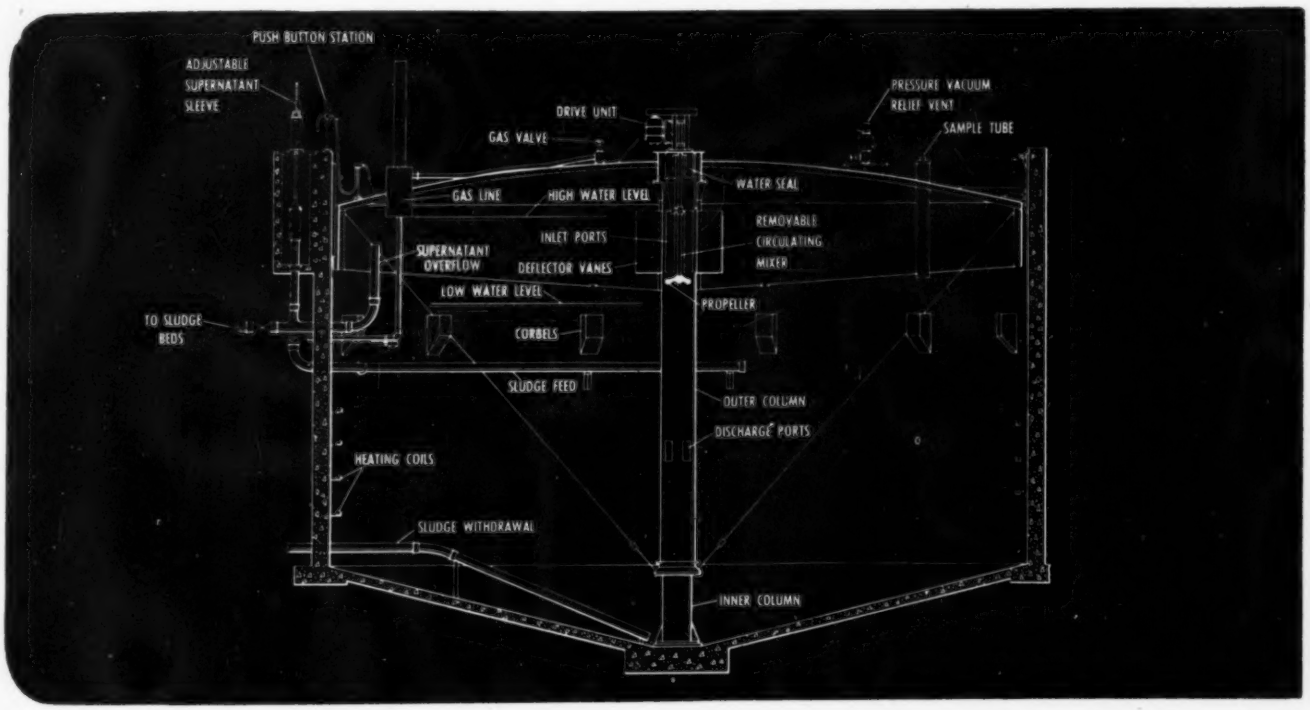

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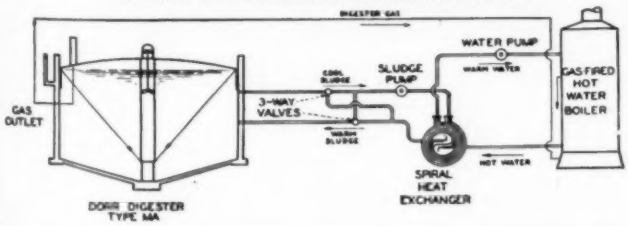

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